AMERICAN JOURNAL of PHARMACY

SINCE 1825

A Record of the Progress of Pharmacy and the Allied Sciences

Vol. 95 NOVEMBER, 1923 No. 11

CONTENTS

Editorial:
- Sunshine Therapeutics 789
- "Spirit of Bone and Essence of Blood" 791

Original Articles:
- Ligatures and Sutures. III. (Illustrated.) By Dr. F. B. Kilmer, Ph. M., G. S. Mathey, Ph. G., Ch. G., B. C., and H. G. Dobbs, New Brunswick, N. J. 794
- The Evolution of Chemical Terminology. VII. Electrolyte. By James F. Couch, Washington, D. C. 806

Abstracted and Reprinted Articles:
- The Detection of Methanol in the Presence of Ethanol. By Charles H. LaWall, D. Sc., Ph. M. From *Transactions*, Wagner Free Institute of Science of Philadelphia 812
- The Practice of Pharmacy Under the Volstead Act. By Ambrose Hunsberger, Ph. M. From *Annals* of the American Academy of Political and Social Science 820
- Theophrastus of Hohenheim, Called Paracelsus. From *American Medicine* 840
- Adventure, Romance and Science. From *Science* 848
- Slaves of the Lamp of Science—A Poem. From *Milwaukee Sentinel* 855

Medical and Pharmaceutical Notes 856
News Items and Personal Notes 858
Book Reviews 860

Price $3.00 per Annum in Advance. Foreign Postage, 25 Cents Extra.
Single Numbers, 30 Cents. Back Numbers, 50 Cents.

Entered as Second-Class Matter at the Post Office at Philadelphia, Pa., Under the Act of March 3, 1879.

Acceptance for Mailing at Special Rate of Postage Provided for in Section 1103, Act of October 3, 1917. Authorized February 15, 1920.

PUBLISHED MONTHLY BY THE

Philadelphia College of Pharmacy and Science

145 North Tenth Street, Philadelphia

THE AMERICAN
JOURNAL OF PHARMACY

VOL. 95. NOVEMBER, 1923. NO. 11.

EDITORIAL

SUNSHINE THERAPEUTICS.

That most forms of life are benefited by a certain degree of exposure to sunlight is shown by actual observation and indicated by simple reasoning. Life, as human beings know it, has been evolved under constant action of light, and the only important source on this planet is the sun. Whether in a remote past other sources, such as radio-active elements, were functioning, we cannot say, nor is it necessary to discuss the question. It is now well known that a large proportion of the light emitted by the sun is invisible to human eyes, and it is probable that if observations could be made at elevations of fifty miles or so, a very large amount of invisible rays would be found. The conditions of modern civilization interfere materially with the action of light. Clothing, shaded dwellings, glazed windows, the construction of buildings in such a way as to require artificial light, all such conditions bring about somewhat abnormal influences. The teachings of physicians and sanitarians have been for many years continuous and active on this point, and the present status of the subject has recently been set forth by Dr. C. W. Saleeby, of London, in a lecture before the Royal Institution of Great Britain. Some of the data of this lecture will be useful and interesting.

More than twenty-five centuries ago Zarathustra, one of the great leaders of "Sun-worship," taught the cult of the sun and the green leaf, instead of pillage and murder. In the beginning of scientific medicine, some centuries later, Hippocrates, practising in the temple of Aesculapius at Cos, used sun-cure. Aesculapius was the fabled son of Phoebus Apollo, god of the sun, medicine and music. Galen, about the beginning of the present area, used sunlight therapeutics. The sun-cult fell into disrepute because, under the later theology, it was considered to be a form of nature-worship. Instead of sanitary measures, incantation and the "royal touch" were much

in evidence. Real scientific hygiene is not yet a century old. In 1856, however, Florence Nightingale vigorously but vainly protested against the proposed arrangements of a large British hospital because no sunlight could enter the wards. In the '70's Benjamin Ward Richardson hammered persistently upon this theme, and offered the plan of an ideal city "Hygeia," in which abundance of sunlight was a feature. He also, by the way, suggested some engineering features which would be very satisfactory in the operation of the modern city. In 1877, Downes and Blunt showed that sunlight will kill anthrax bacilli, and in many writings at this period John Ruskin inveighed against the "plague cloud" of smoke in the cities. In 1890 Dr. T. A. Palm, of England, showed by a geographic method that lack of sunlight is a large factor in the causation of rickets. The paper, however, was ignored, a not uncommon fate of pathfinders in science. Dr. Saleeby enumerates many other instances of the value of sunlight in preserving health and curing disease. The science and art of the method are set forth in a work recently translated from the French.

It has been shown that beneficial effect of the sun's rays is due to the light, not to the heat. As long ago as 1779, Ingenhouss showed that the dissociation of carbon dioxide by the green leaf is a light and not a heat action. The distinction is important, for harm has been done by exposing patients to sunlight under conditions which lead to over-heating. It seems to be a growing impression that the action of light is more valuable in increasing the bodily resistance to infection than to the direct toxic action of the organisms upon which the infection depends. It seems also probable that the so-called ultra-violet rays are more active than the visible ones. To such condition is due the effect of the Finsen light and x-rays. In this connection it must be borne in mind that most common transparent materials, glass, mica, celluloid and gelatin are opaque to almost all rays above the visible violet. All enclosed sun parlors, therefore, will seriously modify the light. Experiments, especially by Dr. R. W. Wood, have shown that in the open air, on a clear day, notwithstanding the absorptive power of the atmosphere for ultra-violet rays, a notable amount thereof does reach the earth, but the glass of an ordinary window will cut this out completely.

Some of the most striking evidences of the value of sun-cure have been recently obtained by Dr. Alfred F. Hess in New York, who has shown the control that exposure to sunlight will exercise

in cases of rickets, especially that which is produced in experimental animals by a defective diet. Hess has extended his investigations, and shown that sunlight will increase the proportion of phosphorus in the blood, also the calcium content. He and co-workers have also investigated the comparative resisting power of textiles, finding that these differ in their absorbing action. It seems also that the vitamin and other nutrient contents of cows' milk are materially diminished by the housing of the animal during the winter season. Advantage may be taken in time of the fact that when it is winter in the Northern hemisphere, it is summer in the Southern, and with the modern high-speed methods transportation and cold storage, fresh milk from grazing cattle may be obtained all the year 'round. Here the high-speed airplane may be of great value. Dr. Saleeby's lecture covers a very large field and relates to phases of hygiene and therapeutics of much interest and importance. He concluded by saying that the restoration of sunlight to our cities is the next great task of public health authorities.

HENRY LEFFMANN.

"SPIRIT OF BONE AND ESSENCE OF BLOOD."

In 1692 William Penn sat down in his house in Philadelphia and laboriously wrote his initals upon the fly-leaf of the little volume which is now upon the writing table before me. "William Penn—Proprietor of Pennsylvania, His Booke"—that is the legend upon his deftly fashioned book plate. Proprietor of *Pennsylvania*—then a placid Indian loved land—just beginning to unfold its bounties to the palefaced crew.

And Penn, who lent his name to this the State of States, was not ashamed to place it also in the little book, his Medical Companion. For there on the fly-leaf it is, an expression of confidence in his medical *vade mecum.*

But Penn's confidence is not of a class with the confidence of one William Rowland, "Doctor of Physick," author of the book, who bravely starts his introduction thus: "The Like Book Never Extant Before"—proud old author, whose tongue still wags in cryptic converse, although his bones have long since dried to common dust.

And what a book it is—full of that charm and mellowness that

only comes with age, and writ in crisp, decisive English that brooks no misinterpretation. The boldness of its statements and the guileless way whereby it disposes of things of great moment, call for naught but admiration. But admiration turns to awe when we delve still further into the text and come upon the nauseous methods of treating disease and formulas vile whereby the apothecary and chemists are guided in concocting their elixirs, balsams, unguents and magisteries.

"Take thou," commands the book, "the Brain of a young Man under twenty-four, that dyed vyolently, with all its Membranes, Arteries, Veins and Nerves, with all the Spinal Marrow, beat it, (which is mighty good advice to the feeble-hearted) and add Cephalick waters and Lilly-convals, four inches above; let stand awhile, then distil by cohobation. Make a salt from the calcined residium and joyn on to the Spirit. *Vertues:* It is a brave antieplileptick." To which we add—that only a brave epileptic indeed, would ever open his mouth to such a gruesome beverage.

But that is not all. Elsewhere we find mummy, dried and powdered, moss from a dead man's skull, elixir of urine, magistery of cat's blood, foam from the mouth of a mule, and Oil of Egyptian carcass with this alluring addendum: "Note. Quercetan *takes it fresh.* Vertues. *It hath all the properties of the Natural Carcass, Balsam, and the tincture exalted hath such a quickening quality that it pierceth every part and cures all ulcers and corruptions."*

In the apothecary shops, states the Dispensatory, are the following bits of medical delicatessen.

In Shops

are things taken from the body living—Genus Homo-Man—which is ever best when redhaired, as: 1. The Hair, 2. The Nails, 3. The Spittle, 4. The Ear-wax, 5. Blood, 6. The Sweat, 7. The Body-lice

Or from parts of dead bodies, as: 1. The Flesh, 2. The Grease, 3. Moss of the Skull, 4, The Heart.

NOTE.—*Some for a Quartan fever take the hairs pulled out of the redheaded patient, roast them in an egg, and cast them to birds.*

And so we could go on in merry quotation, and wondering all of the time how came about the survival of the redheaded fraternity. The old book has a wicked spite against the crimson-topped species, and such paragraphs as the following may account for the current scarcity of that variety of hirsute pigmentation.

"Chose the carcass of a redhair'd man (whose blood is thinner and flesh better), whole and sound, of twenty-four years old, not dyeing of a disease, but killed, etc."

Such was the materia medica of the old practitioner of Physick, and we, of this age of advancement and enlightenment, are horrified with his vulgar equipment.

We smile with a cynical, superior smirk, when we think of such infantile idiocy. "Essence of bone and spirit of blood"—idiocy we say—and yet the dapper young doctor who cares for our physical welfare today, is prone to affect the same style of treatment and often resorts to a kindred zoologic equipment.

Time was when crude botanic drugs from India's jungles or Africa's teeming wilds filled up the shelves of the old apothecary shop. Today the stock yards of the Middle West have claimed their share of drug shop patronage. The bleating calf—the gentle sheep—slovenly sows and other children of the four-legged race, furnish a deal of the drug store's healing agents.

The day of "extract of menagerie" is still with us, even if the "elixir of botanical garden" is no longer the vogue. To corroborate the old quip that history truly repeats itself, comes now Insulin, the latest addition to our animal armamentarium for fighting disease, for it is also an extract of quadruped. Surely the old formula scribes were not so silly after all.

Insulin is designed to fight the dreaded sugar sickness, known as diabetes. And Insulin after all, is second cousin to spirit of bone and essence of blood, for out of the suckling calf came the original lot. Now, however, the chemists say that four legs are not prerequisites to its manufacture. Fishermen of the deep seas, who used acute invectives when the gullible skate or vicious shark mauled up their clammy bait, must now regard these finny things with more respect, for out of them, say the chemists, will come anon the large supply of Banting's cure for diabetes.

Thus the animal kingdom yields again potential curative agents. To be sure the terminology has largely changed, for the newer nomenclature is much more finicky, with its hormones and its vitamines, its adrenalin and insulin—its alexins and antigens. But despite the erudite effort to hide their identity, essence of bone and spirit of blood are back to their own again.

IVOR GRIFFITH.

ORIGINAL ARTICLES

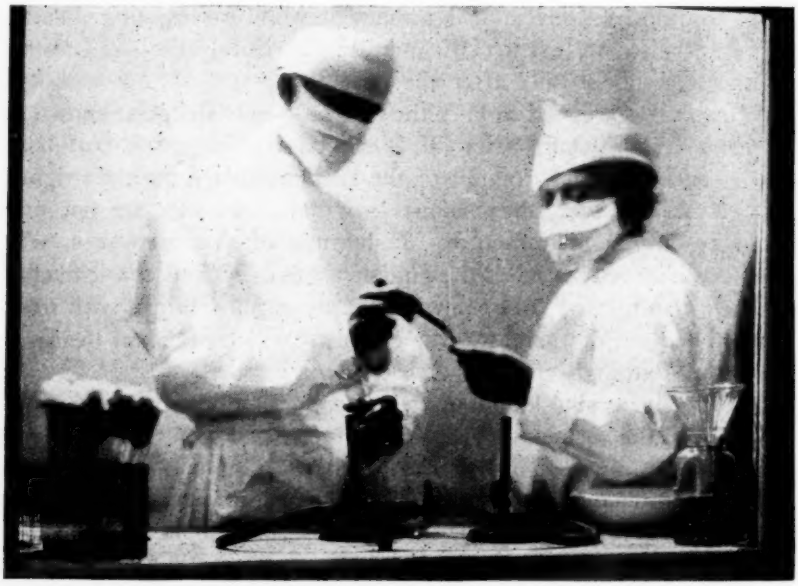
LIGATURES AND SUTURES.

By Dr. Fred B. Kilmer, Ph. M.; G. S. Mathey, Ph. G., Ch. G., B. C., and H. J. Dobbs.

This is the third of a series of papers discussing the subject of Ligatures and Sutures from a pharmaceutical standpoint. While in many respects elementary and incomplete, it is hoped that its publication may assist the pharmacist in handling this class of material.

The Bacteriological Testing of Ligatures.

A few of the larger hospitals have adopted systems of periodical bacteriological tests of ligatures. Such a course might well be extended. The Medical Departments of the Government have likewise established a routine test for ligatures. Of course, it would be impossible to test every ligature, as in the test the ligature itself is necessarily destroyed.



Ligature testing room—view through glass window. The room is supplied with filtered air.

It is well within the province of the hospital pharmacist or laboratory technician, or the pharmacist who has laboratory facilities, to carry out such a work. Some of the manufacturers of ligatures have established methods by which samples of every lot or batch made are tested bacteriologically before being released. The processes here detailed are those used in our own laboratory, and they are applicable to ligatures and sutures as supplied in the two ordinary forms—sealed envelopes and sealed glass tubes.

Our experience in opening these containers in order to remove the contents to culture tubes of sterile broth, has taught that certain very delicate procedures are necessary to prevent contamination.

While it is true that there are several hundred known species of bacteria, fortunately only a few are harmful to the human system. The ligature-maker, however, must destroy all organisms whether harmful or benign. In testing ligatures the standard can only be freedom from all growth.

Culture Medium.

The culture medium used is broth prepared as usual for culture work—beef, salt and peptone in water, having a faintly alkaline reaction. It is placed in very large test tubes, one and one-quarter inches in diameter, holding about 75 cc. of broth, and plugged with non-absorbent cotton stoppers. These tubes of broth are now sterilized by steam at fifteen-pound pressure. Such tubes of broth keep indefinitely and when sterile are perfectly transparent. A turbidity, or pellicle, is produced as soon as any bacterial growth takes place.

To prove their sterility all of the tubes are incubated at 37.5° C. (99.5° F.) for five days, before they are deemed fit to use in testing for sterility of ligatures.

The ligature contained in one envelope or tube is removed and transferred to one culture tube of broth. A number of these tubes, with their mouths plugged with cotton, are kept under daily observation at 37.5° C. (99.5° F.) for one week. If no growth appears the ligature is recorded as sterile. If not clear, a microscopic examination is made to determine the char-

acter and, therefore, the probable source of the growth. Other cultural tests may also be made from such growth. Such accidental growth is occasionally the experience of every worker in bacteriology.

Anything short of perfection in transferring from ligature container to culture tube will result in an occasional growth. In this work it is necessary not only to protect the ligature from contact with non-sterile material but to keep it from air exposure in every possible way. Air carries infection by the bacteria-laden dust particles floating in it. These are continually dropping on everything.

Guard Against Air Infection.

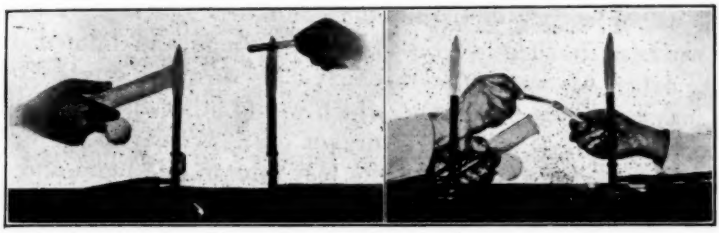
To avoid infection from the air, we have provided ourselves with a small room, entirely plastered, smooth finish, water-tight and air-tight. This room contains a sprinkler in the ceiling from which water or antiseptic solutions can be thrown all over the room, washing down the ceiling, walls, table and floor. This room is fed with filtered and purified air.

While transfers are being made it is advisable to have two Petri dishes of nutrient agar exposed, one each side of the bench, and not over one foot away from each operator. After completing the transfers cover the Petri dishes and incubate them for forty-eight hours; examine any growth that may be present. This serves not only as a control on the room conditions during the transfer period, but also as a guide in case of accidental infection of material during the transferring.

The operators when preparing to make transfers for sterility test use the same precautionary measures that the surgeons do when getting ready for the operating room. They have to scrub up properly, don sterile gowns, sterile caps and sterile masks. The gown is to prevent the dust present on the clothes from being shed during transfers; the caps are for protection from dust present in the hair of the head, and the face masks prevent any spittle that may be ejected from the mouth from reaching and infecting the strands being transferred. Rubber gloves are not worn because they interfere too much with the handling of flame-sterilized tubes and thumb forceps.

Two operators always work at the transfers. One attends to opening the packages, the other holds the test tube, removes

the cotton plug, passes the mouth of the test tube through the flame, heats the forceps in the flame, withdraws the ligature from its container held by his companion, transfers it quickly to the test tube and replaces at once the cotton stopper. The whole operation takes less time than to tell of it—nothing touches the ligature without first passing through the flame. The cotton plug is not laid down or touched except that the outer end is held pinched between the back of the fingers. The total air exposure is not more than six to eight seconds.



Bacteriological testing of a catgut ligature in glass tube. (A) One operator flaming the mouth of the culture tube and the other flaming the ligature tube. (B) Removing the catgut from the ligature tubes preparatory to dropping it in the culture tube.

Opening a Glass Tube.

In opening a glass tube, the tube is first held in the Bunsen flame so that the mark at which it is to be broken and the glass for a short distance on each side of it are enveloped in flame. The tube must be constantly rotated while in the flame, as otherwise it will crack or explode. The sterilizing action of the flame is instantaneous, so that a couple of seconds in it is sufficient to sterilize the exterior of the tube. Now, keeping the fingers as far away as possible from the breaking point, the tube is carefully broken.

If any accident occurs whereby there is a probability of contact of the ligature contents with the fingers or with parts of the glass which have not been flame-sterilized, we discard that tube. The operator who breaks the tube holds the half containing the ligature so that his companion can seize the strand with flame-sterilized forceps and withdraw it. It is then shaken rapidly to remove excess of liquid and dropped at once into the culture tube as previously described.

Opening an Envelope.

When testing ligatures in envelopes the outer printed envelope is removed. This one is merely for mechanical protection and to convey the information printed on it. The outside surface of the sealed paper within it is, of course, not sterile. The end of it is now torn off, the inner paper pulled out until its end projects beyond the outer one. Care is also exercised not to get it wet with any fluid, for this would carry bacteria through the paper.

The operator now tears or cuts off the end of this inner paper as far as possible from the contained ligature. The cut or torn edge is then set on fire in the flame and immediately extinguished by waving in the air. This destroys any bacteria that may be on the paper, and which would otherwise be scraped on to the ligature when it is drawn out. While this is being done the other operator, with the test tube in one hand and the forceps in the other, has removed the cotton plug, flame-sterilized the forceps and mouth of the tube, and now carefully withdraws the ligature, drops it at once into the test tube and replaces the cotton plug.

The Control Test.

As a matter of satisfaction to ourselves we make a control test with occasional lots; that is to say, we purposely infect the test tubes containing a ligature in the broth, after they have been proven sterile by the incubation period, with a known organism. These controls merely prove by their growth that the conditions are right and that bacteria would grow if they had been present in the ligatures tested.

The above-described tests are, of course, aerobic.

There are constantly present in the air aerobic bacilli in the spore form which are as resistant as the hardiest anaerobic bacteria. For this reason we make both anaerobic and aerobic cultures.

Anaerobic Cultures.

In making anaerobic cultures we use the same culture medium, to which is added 2 per cent. of dextrose. This is added for the reason that it gives a better nutritive media for the development of anaerobes.

This broth is steam sterilized at ten-pound steam pressure only. This tends to prevent the caramelization of the added sugar. Directly after sterilization the broth is covered with a half-inch layer of previously sterilized liquid petrolatum, and the tubes incubated as described above for five days to prove their sterility.

The procedure for transferring the ligature to be tested is the same as described for aerobes.

Testing for Sterility in Antiseptic Sutures.

In testing sutures stored in an antiseptic fluid, or that have been impregnated with chemical antiseptics such as silver salts, mercuric salts, iodine, colloidal metals, etc., it is obviously necessary to overcome the inhibitory influence of the antiseptic to the development of bacterial growth; otherwise a non-sterile suture could well be reported sterile. This may be done in several ways:

First.—By soaking and washing the strands of ligatures in sterile water or sterile physiological salt solutions to remove any water-soluble antiseptic present, then transferring the ligature to the culture tube.

Second.—Neutralizing the antiseptics present by means of chemical reagents, followed by washing out with sterile distilled water, and then transferring the ligature to the culture tubes.

These methods are not at all satisfactory and frequently lead to erroneous results. The greatest drawback is that the ligature strand is manipulated and exposed for too long a period, thereby materially increasing the risk of accidental infection. Moreover, it is practically impossible to wash out or neutralize chemically all of the antiseptic present; besides this, not infrequently, enough chemical reagent is carried over to interfere with the test, thereby nullifying the results.

We have worked out a very simple method that obviates long exposures and eliminates all the objectionable features. It is based upon the fact that all antiseptics or agents that exert an inhibitory influence on bacterial growth do so only up to a

certain concentration or dilution, as the individual case may be, and that beyond this range they cease to function.

To take advantage of this we have, through actual determination, ascertained that by using 400 cc. of culture broth in place of 75 cc. to each strand of ligature, we always overcome the inhibitory action of the antiseptics present. This volume (400 cc.) being rather too large for tubes, we use in this work Erlenmeyer flasks having a capacity of between 500 and 600 cc.

The actual transfers are made in the same way as described for aseptic ligatures, the period of time that the ligature is exposed being the same.

The flasks are incubated in the same manner and period of time. After the ligatures have proven to be sterile, each flask is inoculated with a known organism, and re-incubated for forty-eight hours. The growth developing proves conclusively that had the strand not proven sterile it would have developed a growth. It further proves that the dilution of the antiseptic present was great enough to deprive it of its inhibitory effect.

Bacteriological tests claiming non-sterility of ligatures cannot be considered correct unless a Petri dish of agar is exposed at the site of manipulation during the transference of the ligature to the culture tubes. By this means, data on the condition of the air of the room at the time and place of transfer can be used to assist in determining the probable source of contamination.

From the foregoing it is obvious that by exercising the necessary care highly satisfactory results are obtained.

Testing for Sterility in Ordinary Room.

When a dust-proof room is not available for making bacteriological test, we suggest the following as the next best:

If possible select a small room having but few windows and only one door. Keep the windows shut at all times, also the door. Do not allow any unnecessary traffic in and out of the room. Always keep it clean and free from dust accumulations. Try to avoid having an excess of, or any unnecessary, fixtures and furniture in such a room. In short, the fewer articles present the better it will be for the work at hand.

Should there be any hanging gas or electric fixtures in the room, always see to it that any accumulated dust upon them is removed with a wet cloth, and not by dusting. Dusting never removes dust—it merely scatters it from one place to another.

Shortly before transfers are to be made, wash down the walls, floor and workbench with an antiseptic solution, and as a precautionary measure cover that part of the workbench to be used by the operators with a towel or cloth that has been impregnated with an antiseptic solution and wrung out, so that the entire field within reach of the operators will be protected to some extent from any particles of dust that may float by.

During the making of transfers there should be exposed two Petri dishes of nutrient agar, to act as a control on the air conditions existing during the actual working period.

In doing bacteriological work of this kind it is advisable to acquire the habit of using steady, even motions of the hands and arms, and never allowing brisk, rapid motions. This tends to minimize accidental infection by avoiding air current disturbances in the immediate neighborhood of transfers. It is also advisable to keep the body and feet quiet for the same reason.

Summary of Test Methods.

All transfers should be made in a dust-free atmosphere, and in the shortest time possible consistent with careful manipulation. Always transfer the entire strand from the tube or envelope. Never attempt to cut off portions, and never plant more than one strand to a tube or flask of bouillon.

When testing antiseptic sutures, always use a large volume (400 cc.) of bouillon. Never attempt chemical neutralization or washing off with sterile water. When no growths develop after the required period of incubation, always inoculate with a known organism, and re-incubate for forty-eight hours. A growth should then develop. This proves that the dilution was sufficient to nullify the inhibitory property of the antiseptic present.

It is essential that Petri dishes of nutrient agar be exposed within the operating zone during the period of transfer. This not only serves as a control on the air present at the time, but may well act as a valuable guide in case of accidental infection of some material during transferring.

CATGUT SIZES AND TENSILE STRENGTH.

In the beginning of the present era of surgery catgut was reintroduced as a suture material, and violin strings were utilized. These strings were sized rather arbitrarily, and bore the letters A, B, C, etc. Certain dealers added to the confusion by substituting for these arbitrarily selected numbers. Thus, in the course of time, one dealer's No. 1 or No. 2 corresponded with another dealer's No. 0 or No. 00.

This cut is self-explanatory.

Later a certain wire gauge known as the Brown & Sharpe gauge was brought into notice, and an attempt was made to have ligature sizes conform to this scale.

In order to bring about a uniformity of measurements, there has been introduced a rational scale for catgut measurement. This scale was based upon thousandths of an inch, each size being three-thousandths of an inch increase over the next smaller one. In constructing this scale the numbers so long in use are retained, and so far as possible no apparent change was made in the sizes of the catgut. The improvement consists of a uniform system of measurement and a regular gradation between each size.

This scale of sizes for catgut is exhibited in the table here shown. While some slight variation in size cannot be avoided, this system gives a more regular-sized strand.

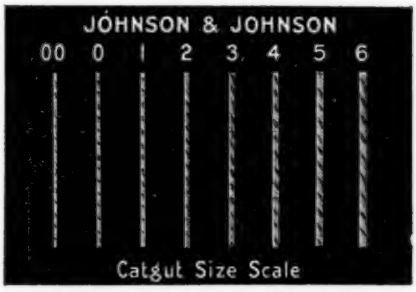
CATGUT SIZE SCALE.

No.	*Thousandths Inch*	*No.*	*Thousandths Inch*
00	12	4	27
0	15	5	30
1	18	6	33
2	21	7	36
3	24		

It should be noted that catgut is an animal tissue spun together, forming a long strand, which may vary slightly in different portions of its length.

Sizes of Silk Ligatures.

In the early days of the Listerian system, silk sutures were confused with the sizes of violin strings of catgut, supposedly conforming to the wire-gauge system. In the course of time a market standard was adopted, in which there are some twenty or more sizes with consecutive numbers. The standard is based upon the yardage per ounce. The following table shows the approximate yardage per ounce of the twenty sizes:



This cut is self-explanatory.

SURGEONS' WHITE TWISTED SILK.

No.	*Yards to Ounce*	*No.*	*Yards to Ounce*
1	2265	11	299
2	1865	12	232
3	1532	13	170
4	1198	14	136
5	932	15	115
6	765	16	95
7	565	17	80
8	465	18	65
9	444	19	50
10	365	20	40

SURGEONS' WHITE BRAIDED SILK.

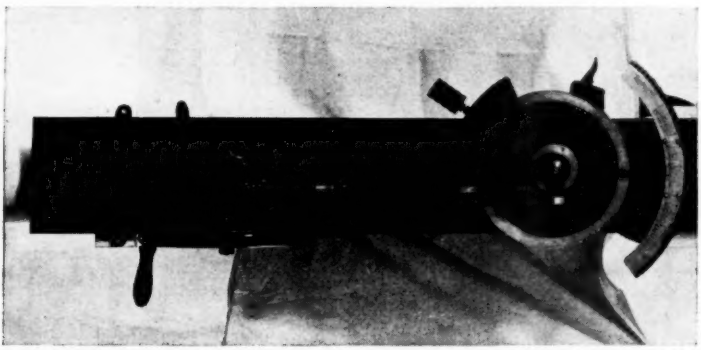
No.	*Yards to Ounce*	*No.*	*Yards to Ounce*
1	670	11	90
2	414	12	80
3	356	13	63
4	320	14	50
5	223	15	45
6	177	16	41
7	170	17	36
8	148	18	31
9	120	19	28
10	103	20	24

The so-called "iron-dyed" or black silk is of the same sizes.

Surgeons frequently use the designations "fine," "medium" and "coarse," which, respectively, would be equivalent to numbers 5, 9 and 12, in twisted silk, and 4, 7 and 10 in braided silk. Approximately, numbers 5, 9 and 12, in twisted silk, and 4, 7 and 10, in braided silk, are equivalent to numbers 1, 2 and 3 in catgut.

Silk is stronger than catgut of the same size, and is not weakened by the ordinary processes of sterilization, or by a variety of influences which tend to weaken catgut and other sutures.

Silk, however, is not absorbable and in most cases must be removed from the wound during or after the healing process.



Apparatus for testing tensile strength of ligatures. The breaking strain is indicated on the dial.

Tensile Strength.

The tensile strength determination on a strand of catgut is not as simple as it appears to be. Considerable care and skill in manipulation is required, also proper observance to prevent injuring the strand prior to and during the actual testing, if accurate results are desired.

In our laboratory we use machines known as single yarn testers. These give very good results, providing of course that all proper precautions are taken.

Inasmuch as the strength usually reported is expressed as the average tensile strength, it is necessary to test from six to twelve strands (usually ten), and the average calculated from the figures obtained on the individual breaks.

At times it may be desirable for demonstration purposes to make tensile strength determination when the proper type of apparatus is not available. In such a case it can be shown by the means of an ordinary hand spring scale. Of course it goes without saying that such a test is purely approximate at best and never as accurate as when made on a testing machine, though it frequently serves the purpose at hand.

Certain precautions are to be observed in testing catgut for tensile strength:

1. It is essential that the strand to be tested is not abused through rough and careless handling.

2. That it be carefully removed from the tube so as not to nick or cut into the strand by pulling it over the broken surface of the glass tube, thereby causing a weak point in the strand.

3. In straightening out the strand to remove the undulations care must be taken not to splinter it.

4. When clasping the strand in the jaws of the machine or attaching it to the scale avoid using so much pressure as to cut the strand.

5. During the application of the pulling load it is essential that it be done at an even and a uniform rate of speed in conjunction with time.

Hand spring scale, usable for gauging approximate strength of ligatures.

6. Never make a test on a looped or doubled strand, always test a single strand.

7. Always make certain of the size being tested by actually gauging the strand. Do not rely on the marking or the eye.

APPROXIMATE BREAKING OF SURGICAL CATGUT ON A STRAIGHT PULL.

Size	*Pounds*	*Size*	*Pounds*
00	4	4	21
0	6	5	24
1	8	6	27
2	12	7	30
3	18		

Never under any condition should an attempt be made to demonstrate or judge the tensile strength of a piece of catgut by pulling or jerking the strand. A sudden jerk will break even a piece of wire. Should it be necessary to judge the tensile strength of catgut, and no apparatus or hand scale be available, hold it firmly between the hands and give the strand an even, steady pull until you reach its breaking point.

LABORATORY OF JOHNSON & JOHNSON,
New Brunswick, N. J.

THE EVOLUTION OF CHEMICAL TERMINOLOGY. VII. ELECTROLYTE.

By James F. Couch.

The term electrolyte is used in two related but distinct senses. Chemists in general refer the term to a class of substances which ionize in solution; physicists apply the term to the electrolyzable material which occupies the space between the electrodes in an electric cell. Biochemists who are interested in the chemistry of the relationships and reactions between living cells and their environment attach the first meaning specifically to the term; physical chemists, particularly those who are exploring the wildernesses of colloidal behavior, also use the term to denote chemical compounds which ionize in solution; electrochemists, when they define the term, behave like all other chemists, and when they employ the term usually follow the connotation of the physicist. The condition would hardly demand more than passing notice were it not for the fact that it is not always easy to determine the sense in which a writer intends the term to be understood and some confusion may arise on this account. It is the purpose of this paper to point out that the term

occurs in these two senses and to offer whatever suggestion appears reasonable to remedy the confusion.

Faraday coined the term in 1834.[3] He says:

"664. I shall have occasion in these Researches, also, to class bodies together according to certain relations derived from their electrical actions (882); and wishing to express those relations without at the same time involving the expression of any hypothetical views, I intend using the following names and terms. Many bodies are decomposed directly by the electric current, their elements being set free; these I propose to call *electrolytes*. Water, therefore, is an electrolyte. The bodies which, like nitric or sulphuric acids, are decomposed in a secondary manner (752, 757), are not included under this term.[1] Then for *electro-chemically decomposed*, I shall often use the term *electrolyzed*, derived in the same way, and implying that the body spoken of is separated into its components under the influence of electricity: it is analogous in its sense and sound to *analyze*, which is derived in a similar manner. The term *electrolytical* will be understood at once: muriatic acid is electrolytical, boracic acid is not." (P. 137.)

"823. In the first place, compound bodies may be separated into two great classes, namely, those which are decomposable by the electric current, and those which are not: of the latter, some are conductors, others non-conductors, of voltaic electricity. The former do not depend for their decomposability upon the nature of their elements only; for, of the same two elements, bodies may be formed, of which one shall belong to one class and another to the other class; but probably on the proportions also (697). It is further remarkable, that with very few, if any, exceptions (414, 691), these decomposable bodies are exactly those governed by the remarkable law of conduction I have before described (394); for that law does not extend to the many compound fusible substances that are excluded from this class. I propose to call bodies of this, the decomposable class, *Electrolytes* (664)." (P. 242.)

"829. iv. A body decomposable directly by the electric current, *i. e.*, an *electrolyte*, must consist of two *ions*, and must also render them up during the act of decomposition.

"830. v. There is but one *electrolyte* composed of the same two elementary *ions;* at least such appears to be the fact (697), dependent upon a law, that *only single electrochemical*

[1] Faraday, of course, was following the Berzelian dualistic theory and thought of the oxy-acids as anhydrides; sulphuric acid was SO_3 for instance.

equivalents of elementary ions can go to the electrodes, and not multiples." (P. 243.)

"On the other hand, the conclusion is almost irresistible, that in electrolytes the power of transmitting the electricity across the substance is dependent upon their capability of suffering decomposition; taking place only while they are decomposing, and being proportionate to the quantity of elements separated (821)." (P. 201.)

These somewhat extended quotations indicate very clearly the concept which Faraday entertained of the term that he coined. By electrolyte he meant any chemical compound capable of being decomposed, under proper conditions, by an electric current; he did not mean to indicate a system that can conduct the current and undergo electrolysis simultaneously. The fact that he excluded from the class electrolyte such compounds as nitric and sulphuric acids which we today include in the class, is understood as due to the prevailing theory of chemical combination which was different from the modern theories. From this beginning, too, we may trace those irritating misconceptions which appear in too many elementary textbooks of chemistry and physics, to wit: that sulphuric acid added to water increases the conductivity of the water and permits its ready electrolysis and the similar statement, doubtless originating in an analogous thought, that the hydrogen produced by the action of dilute hydrochloric acid upon granulated zinc results from the decomposition of the water present in the system!

Proponents of the idea that the term electrolyte refers to the system which actually transports the current from one electrode to the other will get little satisfaction from the definitions offered by the standard dictionaries. The term is defined by Webster's [10] as, "A compound decomposable, or subjected to decomposition, by an electric current"; by Worchester [11] as, "A substance susceptible of direct decomposition by the action of an electric current or the voltaic pile"; by Murray [7] as, "A body which can be or is being decomposed by electrolysis"; by the Century [1] as, "A compound which is an electric conductor, or becomes a conductor when in solution, and undergoes chemical decomposition while the current flows"; by Funk and Wagnalls [4] as, "A chemical compound which can be decomposed by an electric current."

The same idea is current in France. É. Littré defines the

term:[6] *"Corps dont les éléments sont mis à nu par la décomposition électro-chimique."*

Glazebrook[5] gives us an inclusive definition: "A material capable of chemical decomposition under the action of an electric current."

Some of these definitions leave the subject open to debate by employing such non-committal terms as "body," "substance," and "material." Even the word "compound," unless specifically modified by the adjective "chemical," may be considered to refer to systems which are composed of more than one chemical individual. Such conditions are often found in textbooks and frequently make it extremely difficult clearly to understand the author's meaning. Particularly annoying is this sort of thing when one attempts to use the author's statements in solving a question which he has not treated but which is germane to his subject. And, in passing, I may be permitted to suggest that, in the present development of science with its luxuriance of established facts and ideas, it is impossible for an author to consider fully the field about which he is writing; he must pass by many interesting points without notice and there are few topics to which he can devote the careful and detailed attention that the writers of a century ago gave to everything they published. Under these conditions it is incumbent upon modern authors to present carefully considered specific statements without susceptibility of ambiguous thought so that he who reads may be able to use the information without being forced to criticise and confirm it.

In addition to the definitions which I have already presented above there are many others in the literature. I have selected a few which serve to demonstrate the physicist's point of view.

In Duff's excellent textbook of physics[2] Prof. Carman uses the term thus:

> "The former class includes all metallic conductors, while the latter, now called electrolytes, are chemical compounds which can be decomposed by an electric current." (P. 373.)
>
> "Some liquids act like metallic conductors. . . . But another class of liquids show, not only heat changes, but also chemical decomposition, when they are traversed by an electric current. Substances which are thus decomposed by an electric current are called electrolytes. . . ." (P. 405.)
>
> "The decomposition of the electrolyte in solution continues. . . ." (P. 407.)

In Watson's textbook of physics,[9] also an exemplary work, Faraday's first law is stated: "The quantity of an electrolyte decomposed is proportional to the quantity of electricity which passes." (P. 776.) In other places (pp. 777, 790, 791) the term electrolyte is used to indicate the electrolytic solution.

Reed and Guthe[8] are very specific: "The liquid joining the two plates is called the electrolyte." (P. 297.) "Conductors which undergo chemical decomposition when traversed by an electric current are called *electrolytes.*" (P. 320.)

There is more consistency to be found among the chemists than among the physicists, yet the test tube and burette men occasionally wander into the wilderness. Wherever chemical writers are considering phenomena which depend upon ionization they define and use the term electrolyte in the sense of ionizable substances. From this point of view the actual physical condition of the substance is immaterial; there is no explicit reference to any capability of electric conduction although this is always implied for it is inherent in the concept. Frequently, however, the conductivity of electrolytes is a character which is of no importance in the matter under discussion while the ionizability is all-important. But, too often, when chemists are describing the physical phenomena of electrolytic conductivity or when they discuss the parts of an electrolytic cell, they use the term electrolyte to mean the solution which undergoes electrolysis. Some color is lent to this notion by the fact that many electrolytes do not conduct the current until they are in solution and, therefore, it appears that conductivity is a property of the solution rather than of either the solvent or solute. Further analysis of the theory of conduction shows that this idea cannot be accepted in the form stated and every chemist will readily perceive that it is but a half-truth.

The problem in terminology presented by these two distinct concepts resolves itself into this: Are we to denote by the term electrolyte a class of chemical compounds or a class of electrical conductors?

The argument in favor of the latter connotation of the term electrolyte can rest only on the two points of usage and convenience. The concept has no claim to priority and indicates no fundamental distinction unless to it is attached the wealth of association with which the chemist envelops his idea of the word. There is little consistency among those who use the term to indicate the electro-

lytic solution; it is employed now in one sense and again in the other. In the world of commerce the term is used to indicate the solution and its convenience renders it very doubtful whether either grammatical or scientific reasons would prove weighty enough to influence custom.

As opposed to this the concept that the term refers to ionizable substances is supported by priority, usage, utility, and scientific importance. The extension of the term to include solutions of electrolytes was doubtless the result of misapprehension of Faraday's ideas and certainly proceeded from a censurable laxity. On this account that use of the term is unsound.

As applied by the chemist, however, the term is of fundamental importance and forms a vital part of a great universal hypothesis upon which the larger bulk of modern chemical theory is built. The classification of all substances into electrolytes and non-electrolytes is a conception of critical significance for all chemists for it divides his domain into two sharply characterized fields. One class appears attended by the numerous phenomena consequent upon ionization; the other comes with its "normal" behavior, its neutrality, its tendency to complexity. Consider the significance of the term for biochemistry, and colloid chemistry, in the phenomena of living processes and the events of peptization, gelation, or of flocculation that intimately involve the interaction of ionized compounds with dispersed phases and judge the utility of a specific general term to the students of these subjects.

Finally, the conductor concept is weakened by the fact that certain fused substances which the chemist calls electrolytes, conduct the electric current with simultaneous decomposition and in the absence of a solvent, *e. g.,* fused silver chloride.

It appears, therefore, that the widest scientific utility will be best served by restricting the application of the word electrolyte to chemical compounds capable of ionization even though some of these substances, like barium sulphate, may be so insoluble that the actual ionic concentration is very small, and accordingly it is suggested that careful writers in the future should use the term in this sense only and when a conductor of the second class is meant should refer to it as the electrolytic solution or by some other equivalent and distinctive term.

BIBLIOGRAPHY.

[1] "The Century Dictionary and Cyclopedia," 3, 1869. (1911.)
[2] A Textbook of Physics, Ed. A. W. Duff, 4th ed. (1918.)
[3] Experimental Researches in Electricity. (1839.)
[4] "New Standard Dictionary of the English Language," p. 584. (1909.)
[5] "Dictionary of Applied Physics," 2, 317. (1922.)
[6] "Dictionnaire de la Langue Francaise," p. 1322. (1873.)
[7] "A New English Dictionary on Historical Principles," 3, 79.
[8] Reed and Guthe, "College Physics," 1911.
[9] Watson, W., "A Textbook of Physics," 5th ed. (1916.)
[10] "New International Dictionary of the English Language," p. 708, 1919.
[11] "Dictionary of the English Language," 469, (1877).
[12] Earlier articles in this series upon chemical terminology may be found in this Journal, v. 94, pp. 92, 343, 469; v. 95, pp. 150, 227, 533.

ABSTRACTED AND REPRINTED ARTICLES

THE DETECTION OF METHANOL IN THE PRESENCE OF ETHANOL.*

By Charles Herbert LaWall.

The detection of methanol in the presence of ethanol has assumed more than academic importance recently on account of the frequent employment of denatured alcohol in liquors intended for medicinal or beverage purposes.

The identification of methanol when it is the only member of the alcohol group in solution presents no great problem, but when it constitutes but a small proportion of the total alcoholic content peculiar difficulties are encountered which complicate the situation and make it necessary to pursue indirect methods that are always less satisfactory than direct positive identifying tests.

The use of the immersion refractometer in conjunction with the specific gravity is a physical method of recognized value, indirect though it be, and this method is adopted as one of the alternative official methods of the Association of Official Agricultural

*From *Transactions,* Wagner Free Institute of Science of Philadelphia, 10, 1923.

Chemists, it being originally proposed by Leach & Lythgoe (*J. Amer. Chem. Soc.*, 1905, **27**, 964).

All of the chemical methods that have thus far been proposed have been based upon the production of derivatives or decomposition products of the methyl and ethyl groups respectively, and the identification or differentiation of these resulting products by appropriate tests.

One of the simplest and least satisfactory of the older methods, which is frequently quoted in literature of twenty or more years ago, and for which no original reference could be found, is the conversion of the radicles into the respective salicylates. It is true that the odor of methyl salicylate is distinctively different from that of ethyl salicylate, when they are observed separately, but in the presence of a preponderating amount of the latter ester the odor of the former is obscured, and there being no other test than odor for distinguishing them in a mixture, the method is unsatisfactory and unscientific.

One of the earliest of suggested methods is that of Riche and Bardy (*Compt. Rend.*, 1875, **80**, 1076). This, which is exceedingly tedious and time-consuming, depends upon the formation of methylanilin violet. It is one of the official methods of the Association of Official Agricultural Chemists and is of advantage as a confirmation test for medico-legal cases, for the colored solution or dyed strips of wool may be be kept indefinitely and exhibited as evidence. The test is in no sense quantitative, but is one of the most delicate that has been proposed; 0.1 per cent. methanol in ethanol may be readily detected, corresponding to about 0.01 grm. of methanol in the amount taken for the test.

Another one of the official methods of the A. O. A. C. is that of Trillat (*Analyst*, 1899, **24**, 13). This method requires preliminary fractionation with Glinsky bulb tubes and the oxidation of the first fraction with potassium dichromate and sulphuric acid and the subsequent treatment with dimethylanilin and oxidizing agents to produce a colored derivative. This test is even more difficult of application than the Riche and Bardy method and does not give as satisfactory results nor is it quite as delicate.

In the United States Pharmacopeia, 8th revision, the Mulliken-Scudder test (*Am. Chem. J.*, 1899, **21**, 266) was made official. In this method the sample was oxidized by repeated immersions of a copper wire spiral which was heated to redness in a non-luminous flame. The resulting mixture of aldehydes, in a sample containing

both ethanol and methanol, was heated slightly to drive off the major portion of the more volatile acetaldehyde and the identification of formaldehyde by the test with resorcinol and sulphuric acid. This method was not very delicate, a proportion of less than 2 per cent. usually escaping detection. Among the unimportant modifications of this test which are no longer used are those of Prescott (*Pharm. Archives,* 1901, **4**, 86) and Haigh (*Pharm. Rev.,* 1903, **21**, 404).

From the time of the appearance of the Mulliken-Scudder test to the present, most of the efforts of investigators along this line seem to have been confined to the development of the same fundamental idea, *i. e.,* converting the alcohol into an aldehyde and the recognition of the methyl derivative, formaldehyde, by one of its characteristic tests. In 1903 Thorpe and Holmes (*J. Chem. Soc.,* **83**, 314) proposed an oxidation method with potassium dichromate and estimation of the resulting carbon dioxide in the case of methanol, ethanol yielding no carbon dioxide under the conditions of the test.

A few years after the copper spiral method of oxidation had been proposed, the Sanglé-Ferrière-Cuniasse test (*Ann. Chim. Anal.,* 1903, [1], **8**, 82) was published, in which the oxidizing agent suggested was potassium permanganate and the phloroglucinol test was used for the detection of the formaldehyde.

Shortly after this method appeared, Scudder and Biggs (*J. Amer. Chem. Soc.,* 1905, **27**, 892 and 1906, **28**, 1202) made several important contributions to the literature of the subject, reviewing all of the principal tests thoroughly and pointing out their their respective advantages and defects. It was stated by these authors that in the presence of powerful oxidizing agents even ethyl alcohol would give rise to small amounts of formaldehyde and that it was necessary to carry out all tests under carefully controlled conditions as regards amount of oxidizing agent, time of oxidation and temperature at which the oxidation was allowed to take place. This is especially true of the Voisenet method (*Bull. Soc. Chim.,* 1906, [3], **35**, 748), in which a chromic acid mixture is proposed as the oxidizing agent and which has been shown to yield traces of formaldehyde from pure ethanol even in the cold.

It is probably ignorance of this fundamental fact that has been responsible for the reporting by some investigators of the presence of methyl alcohol in liquors where none is likely to be found, *e. g.,* beers.

Another oxidizing agent was proposed by Hinkel (*Analyst*, 1908, **33**, 417) who employed ammonium persulphate and relied for the subsequent detection of the formaldehyde upon the well-known morphin-sulphuric acid reaction.

During the fifteen years that have elapsed since Hinkel's paper was published, most of the methods proposed have been modifications or variants of one or the other of the oxidation methods just reviewed. Among the important references in the literature during this period may be mentioned the following:

Vorisek (*J. Soc. Chem. Ind.*, 1909, **28**, 827); (Deniges *Compt. Rend.*, 1910, **150**, 832); Wirthle (*Chem. Zeit.*, 1912, **36**, 700); Koenig (*Chem. Zeit.*, 1912, **36**, 1025); Bono (*Chem. Zeit.*, 1912; **36**, 1171); Raikow (*8th Int. Cong. Appl. Chem.*, 1912, **25**, 417); Schmiedel (*Pharm. Zeit.*, 1913, **54**, 709); Manzhoff (*Zeit. Unt. Nahr. Gen.*, 1914, **27**, 469); Rinck (*Zeit. Unt. Nahr. Gen.*, 1914, **28**, 98); Blanksma (*Chem. Weekblad*, 1914, **11**, 26); Wilks (*Wellcome Trop. Res. Lab., Bul. Chem. Sec.*, 1914, **1**, 5); Pazienti (*Ann. Chim. Applic.*, 1915, **3**, 279); Reif (*Abs. Kais. Ges.*, 1915, **50**, 56); Fendler, (*Zeit. Unt. Nahr. Gen.*, 1916, **30**, 228); Salkowski (*Zeit. Unt. Nahr. Gen.*, 1916, **36**, 262); Schryver and Wood (*Analyst*, 1920, **45**, 164); Hoton (*Ann. Fals.*, 1920, **13**, 490) and Chapin (*J. Ind. Eng. Chem.*, 1921, **13**, 543); Lyons (*J. Amer. Pharm. Assoc.*, 1923, **12**, 323); Kraemer (*J. Amer. Pharm. Assoc.*, 1923, **12**, 506); Meurice (*Ann. Chim. Anal.*, 1923, [2], **5**, 204).

In the Schmiedel and Manzhoff methods it is proposed to convert the radical into nitromethanilin; in the Meurice method, which I have found very unsatisfactory, a physical separation is proposed by means of a strong solution of ammonium sulphate. All of the other methods are based upon oxidation of the alcohol by one of the oxidizing agents previously mentioned, and usually consist in varying the method of testing for the resulting formaldehyde.

Excellent reviews and criticisms of various methods have been published by G. Cecil Jones (*Analyst*, 1915, **38**, 218); A. O. Gettle (*J. Biol. Chem.*, 1920, **43**, 211) and Jos. W. E. Harrisson (*Proc. Penna. Pharm. Assoc.*, 1920, **9**, 204).

In the ninth revision of the U. S. P., which was issued in 1916, there was adopted a modification of the Deniges test (based on the Sanglé-Ferrière-Cuniasse method), which was given as follows:

"Dilute the alcohol with distilled water until it contains 10 per cent by volume of ethyl alcohol. Transfer 5 mils of the dilute alcohol to a test tube, add to it 2 mils of a potassium permanganate solution (made by dissolving 3 grm. of potassium permanganate in 100 mils of distilled water), and 0.3 mil of sulphuric acid, and allow the mixture to stand for five minutes. Now dissolve the precipitate of manganese dioxide by the addition of sulphuric acid, drop by drop with agitation, then add 1 mil of sulphuric acid and 5 mils of fuchsin-sulphurous acid T. S. and mix them. After standing ten minutes, a colorless liquid results (*methyl alcohol*)."

The foregoing test is intended to be applied to ethyl alcohol of 95 per cent. strength. It may, however, be adapted to all kinds of distillates suspected of containing methyl alcohol if the concentration is brought to the proper degree by fractionation or dilution. In the presence of methyl alcohol a violet coloration appears in the final liquid, which color is proportionate in its intensity to the amount of methyl alcohol present.

This test was severely criticized after it had appeared as an official test, many observers stating that all kinds of interfering colorations were given by pure ethyl alcohol. In 1919, Ehman (*Amer. J. Pharm.*, 1919, **91**, 594) reviewed the criticisms, studied the test and found that the difficulty occurred on account of directing the addition of the fuchsin-sulphurous acid immediately after the strong sulphuric acid was added, without control of the rise of temperature, or directions to cool before adding the final reagent. Ehman suggested that the temperature of the liquid should be brought down to 25 degrees C. before adding the fuchsin-sulphurous acid T. S., and those who constantly employed the test found his observations and recommendations to be correct.

In consequence of the criticism of Ehman, the test as revised and proposed for adoption in the tenth revision of the U. S. P. reads as follows:

"Dilute the alcohol with water to contain about 5 per cent. by volume of ethyl alcohol. To 5 cc. of this diluted alcohol contained in a test tube add 0.5 cc. of phosphoric acid and 2 cc. of a 3 per cent. aqueous solution of potassium permanganate and allow the mixture to stand for ten minutes. Add 1 cc. of an aqueous 10 per cent. solution of oxalic acid and let stand until the solution is clear brown. Now add 1 cc. of sulphuric acid, cool to about 25 degrees C., add 5 cc. of fuchsin-sulphuric acid T. S., mix well and allow to stand for ten minutes. At the end of this time the solution, when observed against a white background, may have a reddish or pale green color, but not a distinct blue or violet (*methyl alcohol*)."

This test, like the one quoted from the previous edition of the United States Pharmacopeia, is intended to be applied to official ethyl alcohol of about 95 per cent. strength. It may be adapted as a routine laboratory test if the proper concentration is obtained before proceeding with the test.

In both the original and the revised U. S. P. tests the alcohol is highly diluted (to 10 per cent. of alcoholic content in the original and 5 per cent. in the revised test). The oxidation is produced by the addition of a carefully regulated volume of a 3 per cent. aqueous solution of potassium permanganate. In the original test the oxidation was allowed to proceed for five minutes; in the revised test the time is lengthened to ten minutes. The oxidation takes place in a slightly acidulated liquid (in the former case sulphuric acid is used and in the latter phosphoric acid is directed). The clearing away of the colored compounds of manganese is accomplished in the original case by the cautious addition of sulphurous acid solution, which entirely discharges the color, and in the revised test by the addition of 1 cc. of a 10 per cent. aqueous solution of oxalic acid which changes the liquid to a clear brown, the color being finally discharged by the acidulation with 1 cc. of sulfuric acid, which is directed in both tests, in the latter case the warning being given to reduce the temperature to 25 degrees C. before proceeding further.

If methyl alcohol is present there will be found in the solution at this stage of the procedure, formaldehyde as well as acetaldehyde, which is present as the corresponding oxidation product of ethyl alcohol. In the official application of the test from this point use is made of a test which is not specific for formaldehyde but is a test for aldehydes in general. The inhibition of the reaction for acetaldehyde is accomplished by the acidulation with sulphuric acid to a proper degree to accomplish this result.

A careful study has been made of the several factors of importance in the application of the test and to determine the approximate degree of sensitiveness, if possible. Comparisons were made throughout the work, of both the old and the new U. S. P. tests. After working with both for a few days the advantage of the latter over the former was recognized, and a way was found to still further obviate the possibility of overheating the mixture when the sulphuric acid is added just before the final stage of the test and to avoid the necessity of cooling as directed. This was accomplished by the simple and satisfactory expedient of employing a sulphuric

acid solution which had already been diluted to a point at which it no longer heated when diluted still further.

The matter of the dilution of the alcohol was first studied to determine whether the 10 per cent. or the 5 per cent. dilution is preferable. There seems to be little or no choice in this matter, except that in the 10 per cent. dilution the color comes up a little more intensely. In the matter of sensitiveness none of the variations was capable of detecting with any degree of certainty a smaller proportion of methanol than one part in five hundred parts of ethanol. This corresponds to about 0.001 grm. of methanol in the amount taken for the test by the U. S. P., IX, and about half this amount by the proposed revised test.

The sensitiveness of the fuchsin-sulphuric acid T. S. was then tested out upon solutions of formaldehyde of known strength and was found to respond to 1 in 10,000 within five minutes and to 1 in 100,000 within twenty minutes.

The failure to detect smaller quantities of methanol than was experienced in practically carrying out the test is undoubtedly due to a failure to oxidize the methyl alcohol in the presence of a great excess of ethyl alcohol or the possibility that it may be completely oxidized to formic acid and thus destroyed for the practical purposes of the test.

Some experiments were then conducted to ascertain the effect of larger proportions of the oxidizing agent and the effect of longer periods of oxidation as well as of increased temperature during oxidation. These experiments showed that increasing the time of oxidation up to as much as one hour had no effect upon the final result except to increase the sensitiveness of the test; that increasing the proportion of oxidizing agent to more than double the amount directed (5 cc. instead of 2 cc. of the 3 per cent. aqueous solution of potassium permanganate) caused pure ethyl alcohol to react positively toward the test, and that heating with the permanganate solution invariably caused the production of formaldehyde from pure ethyl alcohol.

Instead of using the fuchsin-sulphurous acid reagent in the final determination a number of the other tests for formaldehyde were employed. The resorcinol test and the Leach test were found satisfactory within certain limits but less sensitive than the official test. The modifications of the phenylhydrazin test were found to be unsatisfactory, either on account of the interfering substances

resulting from the preliminary treatment or because they were so delicate as to give positive reactions even with pure ethanol.

The conclusions drawn after conducting many hundreds of experiments over a period of several months, during which abundant opportunity occurred to try out various proposed methods with unknown samples of commercial origin, are that the test as proposed in the U. S. P., IX, is very satisfactory when the precaution is observed of reducing the temperature of the liquid prior to adding the fuchsin-sulphurous T. S., but that the modifications as proposed for the U. S. P., X, especially in the use of oxalic acid instead of sulphurous acid for dissolving the precipitated managanese oxid, are improvements over the original test.

A still further improvement has been made in which the necessity of reducing the temperature of the liquid during the test is obviated. The proposed test is carried out as follows:

Dilute the alcohol with water to contain about 5 per cent. by volume of ethyl alcohol. To 5 cc. of this diluted alcohol, contained in a graduated test tube of 20 cc. capacity, add five or six drops of phosphoric acid and 2 cc. of a 3 per cent. aqueous solution of potassium permanganate and allow the mixture to stand for ten minutes. Add 1 cc. of an aqueous 10 per cent. solution of oxalic acid and allow it to stand until the liquid is a transparent brown. Now add 5 cc. of a previously diluted and cooled sulphuric acid (which has been diluted in the proportion of 3 volumes of water to 1 volume of acid), add 5 cc. of fuchsin-sulphurous acid T. S., mix well and allow to stand for ten minutes.

At the end of this time the solution when observed against a white background should not show a distinct blue or violet tint (*methyl alcohol*).

The use of graduated test tubes greatly simplifies the operation as a routine test and the employment of the previously diluted and cooled sulphuric acid enables the operation to be carried out with greater certainty and expedition.

A method of making the record of the test permanent which has also been found to be of advantage is to dye the color on strips of white wool, following the customary procedure as in the dyeing test for coal-tar colors.

The test is sensitive to 1 part of methanol in 500 parts of ethanol. If smaller proportions of methanol are present or sus-

pected, a preliminary fractionation may be carried out and the test applied to the 1 cc. fraction coming over first from a 10 cc. sample. In this manner positive reactions were obtained with as small amounts as 1 part of methanol to 10,000 parts of ethanol. Smaller proportions than this would be without practical significance

---

THE PRACTICE OF PHARMACY UNDER THE VOLSTEAD ACT.*

By Ambrose Hunsberger, Ph. M.

I.

For the purpose of impressing a more precise picture upon the minds of those who may have given no special thought to the vexing prohibition problems which confront practicing pharmacists, it seems proper to ask indulgence for the presentation of a brief résumé of the gradual development of the practice of pharmacy previous to the adoption of the Eighteenth Amendment, and also to give brief consideration to some of the chief factors involved in pharmaceutical procedure.

What Is Pharmacy?

Pharmacy is defined by Remington as being the science which treats of medicinal substances. It comprehends not only a knowledge of the arts of preparing and dispensing medicines, but it also provides methods for their identification, selection, combination and analysis. It further provides facilities for research leading to the discovery of new remedies, as well as to the application of old remedies to new uses. It fosters and builds up the collateral branches of science, which constitute a part of its organism and contributes much, through the unselfish labor of its votaries, to the scientific and material wealth of the nation.

Early History.

While the practice of pharmacy has been carried on in a more or less methodical manner for two or three centuries in European countries, its systematic development in this country began about

*Reprinted from *The Annals* of the American Academy of Political and Social Science, Philadelphia, September, 1923. Publication No. 1730.

one century ago. Previous to that period the few scattered apothecaries, whose apprenticeship had been served as assistants under medical direction, strove valiantly to improve the disorganized system of hawking medicinal remedies which prevailed throughout our thinly populated country. There was no method of protecting the public from fraud through control or regulation of the sale of adulterated and harmful medicinal products, and the credulous citizenry of the young nation was beguiled by every description of fakir and charlatan into buying their fantastic panaceas.

As the nation grew in population and wealth, it became increasingly apparent that a concerted effort must be made to establish some system of control and supervision over the sale of medicinal substances, in order that the physical welfare of the communities might be better safeguarded. A further need was felt for the laying of a foundation upon which might be built a scheme of systematic study of pharmacy and the collateral branches.

The First College of Pharmacy.

Acting upon this conviction a meeting of apothecaries was held in Carpenters' Hall early in the year 1821. The deliberation of this earnest body of young men, who were fired with zeal for scientific and humanitarian achievement, culminated in the organization of the Philadelphia College of Pharmacy, where a regular system of lectures in the different branches was inaugurated in November, 1821.

This laudable movement, which was so ably launched, marked the first step forward in the development of a system of pharmaceutical practice in the United States. The movement gained great impetus during the intervening years through the continuous effort, unselfishly contributed by those pioneers and their successors, toward the expansion and improvement of the practice of pharmacy as a separate entity.

The Code of Ethics.

A code of ethics governing the conduct of pharmacists who subscribed to it was adopted in 1848. The principles contained in the code convey the impression of having been drawn by men of high moral purpose and marked intellectual attainment. The introductory paragraph states that

> Pharmacy being a profession which demands knowledge, skill and integrity on the part of those engaged in it, and being associated with the medical profession in the responsible duty of preserving the public health, and dispensing the useful though often dangerous agents adapted to the cure of disease, its members should be united on some general principles to be observed in their several relations to each other, to the medical profession and to the public.

The principles required adherence to a certain standard of scientific attainment and professional conduct, limited the scope of activity, discountenanced secret and quackish methods, encouraged the interchange of scientific knowledge, denounced the use of any except the purest in drugs, recommended discontinuance of the sale of poisonous drugs except on physicians' prescriptions, and held, where there was reason to believe that a purchaser was using stimulants or opiates to excess, it was the duty of the conscientious pharmacist to discourage the practice by refusing to make the sale.

Professor Procter, a pharmaceutical leader in his day, in the crusade against those elements of evil that were debauching the professions of pharmacy and medicine of that period, said:

> "When we look abroad in the land and witness the working of the complex systems of quackery which, like the miasma of an infected region, hovers over every city and penetrates every village, leading thousands astray by hollow promises and lying certificates of cure, whilst legitimate means are neglected, or overlooked, we cannot but desire that the strong arm of the law might reach forth and banish them from among us."

Organization.

Coincident with the expansion of the scheme of systematic pharmaceutical education was the formation of local, state and national pharmaceutical organizations, the members of which freely gave of their time and substance in the interest of the advancement of their calling. Delegates from the different sections of the country met in conference annually, discussed their problems and sought for a solution. The national organizations which took a prominent part in the developmental plan were the American Pharmaceutical Association, The National Association of Retail Druggists and The National Wholesale Druggists Association.

Legislation.

With the steady increase in the native population, augmented by the influx of many immigrants from foreign lands, the problem of adequately regulating the practice of pharmacy became more complex and the responsibility greater.

Being convinced of the obligation of the state to safeguard the lives and health of its citizens and confident that statutory enactment would accomplish the reforms that "resolving" had failed to bring about, it was decided by the organized pharmaceutical bodies to invoke "the strong arm of the law" as suggested by Procter.

Bills were drawn which provided for official examining boards having power to grant certificates to practice to successful candidates having proper preliminary qualifications. Graduation from a college of pharmacy of good standing was made a prerequisite in most states. A pedagogic standard for colleges was established. Restrictions governing the sale of poisonous, adulterated and vicious drugs were included and penalties for violation of any of the provisions were attached. All of these measures had the full support of the pharmaceutical organizations when presented to the different state legislatures for enactment. Equal support was given to the enactment of the Federal Drug Import Law, the Pure Food and Drugs Law, the Harrison Narcotic Law and all other legislation, state and Federal, that had for its object the conservation of public health and the protection and preservation of human rights.

Advanced Educational Standards.

In proportion to the growth of the country the need for greater numbers of adequately trained pharmacists increased. This condition was anticipated and taken care of by organizing other colleges of pharmacy throughout the country. The scholastic standards of the newer institutions as well as those established in the earlier days kept pace with the educational development of the nation.

Where night lectures several times a week had sufficed in the early part of the last century, full day periods of lecture and laboratory work for three, four, or five days a week were substituted in its latter years. The early plan of apprenticeship was discarded and replaced by a strict requirement of four years' practical drug-store experience as an applied-training prerequisite to graduation. Preliminary educational requirements for admission to college courses were extended to four years of high school study or its

equivalent. Courses were extended to cover the following subjects: Theory and practice of pharmacy, general and pharmaceutical chemistry, botany, biology, physiology, physiological assaying, mathematics, pharmaceutical Latin, bacteriology, hygiene, materia medica and general pharmacognosy.

The progress made in the adoption of advanced standards of pharmaceutical education during the last century is marked and compares favorably with the advances in educational requirements made by any of the older professions.

Scientific Contributions.

During the process of building up a system of pharmaceutical practice in the United States, and as a result of it, a splendid group of men and women of marked scientific ability was developed. These builders have gone out in the world and enriched its scientific literature by their unselfish contributions. They have made possible the development of large industrial enterprises and they have contributed immeasurably to the comfort and safety of the citizens of the nation by their diligent research in the field of food and drug adulteration; and by their unremitting effort to provide a systematized and safe materia medica they have increased the effectiveness of the physicians' armamentarium, thereby simplifying to a great extent the task of ameliorating the ills of suffering humanity.

The names of Parrish, Procter, Maisch, Wilbert, Remington and those of many other unselfish pharmaceutical workers are writ as high upon the walls of the temple of American science as are the names of Washington, Jefferson, Lincoln and Roosevelt upon the scroll of American statecraft.

Economic Growth.

The economic side of pharmaceutical development in America has kept pace, step by step, with its scientific evolution. Modest efforts to establish pharmaceutical manufacturing plants met with success and the small beginnings gradually grew into institutions of tremendous size, employing thousands of scientific and other assistants and involving investments of capital which aggregate many millions of dollars.

The manufacturer of pharmaceutical and heavy chemicals like-

wise begun in a small way has grown into gigantic proportions and represents enormous investments of capital in buildings and equipment, providing employment for other thousands of workers, scientific and technical.

Directly related to the economic side of pharmacy are other large, well-organized plants which manufacture surgical supplies, chemical specialties, vaccines and antitoxins, glandular products, essential oils, etc. The products which are annually sent out in enormous volume from these various plants go into every part of the civilized world and they carry with them the message of American progressiveness and scientific efficiency.

Wholesale distributors of drug products represent another important link in the economic chain. They have multiplied from a scattered few, who carried on a small business in imported and native crude drugs a hundred years ago, into hundreds of large, competently managed enterprises, whose annual turnover in drug-store commodities represents investments of hundreds of millions of dollars and provides employment for thousands of people.

The discussion of these factors of production and supply of pharmaceutical essentials necessarily comes under the head of economic development. There is, however, no intention of conveying the impression that they limit the efficiency of their products by any rule of dollars and cents. On the contrary, those who have achieved the greatest measure of prestige and success have done so through strict adherence to a well-defined policy of scientific laboratory control of their processes. The outstanding concerns maintain independent laboratories thoroughly equipped and well manned for continuous research purposes. While a portion of the work which is carried on by their investigators is directed toward maintaining the quality of their own products, that part of it which is of general scientific interest is published in scientfic and technical journals as a voluntary contribution to the sum total of human knowledge.

The Pharmacist on the Corner.

The radical change in pharmaceutical practice which the passing of a century has wrought is perhaps most strikingly evident in the retail field. The evolution of the latter-day pharmacist, from his prototype in the person of the humble dealer in crude drugs performing his circumscribed task of assisting the doctor of his

day, to the present-day graduate with his high school education, four years' pharmaceutical experience, a pharmacy college diploma in one hand and in the other a certificate from his state pronouncing him qualified to practice, represents an advance, indeed. In proportion to the increase in his cultural attainments, the position of the pharmacist as a community factor became more important and his responsibility greater. The service he was able to render is essential to community life and comfort, and the different states in recognition of this, and the further fact that he has properly qualified himself, give legal sanction by granting a certificate which entitles him to perform certain services and denies the same privilege to others who have not qualified similarly.

By virtue of the character of service which may be rendered by him, the pharmacist is brought into more frequent and intimate contact with the domestic affairs of a community than is any other single element in the social structure. Be the problem in question one concerning health, hygiene, church, politics, morals, ethics, finance, or what not, the assumption is a fair one that at one stage or another in its solution you may find that the pharmacist is consulted.

The major obligation of the pharmacist lies in the domain of health, conservation and restoration. In this he is an important if not an altogether indispensable factor as an adjunct to the intelligent treatment of disease. A full and complete discharge of this obligation is a professional duty performed in behalf of community welfare. The state anticipates that the obligation will be met as a *quid pro quo* for the exclusive privilege to practice which it grants to the pharmacist.

Duties.

The duties involved in fulfilling his obligation are exacting and the responsibilities grave. There is no middle course along which to steer. Complying with all the requirements concerning licensure, registration, permits, etc., constitutes a primary detail of preparation. Then must be provided an establishment properly equipped with official records and formularies, journals, apparatus, stock, and competently manned.

Supplies must be provided in sufficient variety to meet without delay emergency calls for any one of many thousands of medicinal substances, surgical aids or hygienic devices. Proper storage

facilities must be available for the protection of articles susceptible of deterioration through exposure or age. Care must be exercised in the purchase and manufacture of preparations in order that the official standard of quality may be maintained. An alert and ready force of competent assistants to meet any demands upon these resources must be on duty during many hours of each day.

Constant vigilance in the field of research must be exercised in order that new remedies may be made promptly available to the sick and suffering.

Responsibilities.

The responsibilities with which the pharmacist is charged place him in a somewhat unique position, since there is perhaps no other class of citizens given equal custodianship over the acts of their fellow citizens.

The pharmacist quite naturally is responsible for his own errors and those of his assistants, as well as for the quality of drugs which he dipenses. He is further charged with responsibility for errors made by prescribers in ordering overdoses of dangerous drugs in prescriptions, and for the control of drugs which are habit forming; also for the sufficient medication of prescriptions containing alcohol and for restriction of the distribution of alcohol and liquors, for the genuineness of the form upon which liquor is prescribed, as well as for the good intent of the prescriber of liquor or narcotic drugs. Finally, he must satisfy himself that such alcoholic or narcotic preparations as he may dispense according to law will not be applied to a wrong purpose by the purchaser.

With several exceptions, which are discussed later, these responsibilities have been assumed cheerfully because pharmacists as a class are primarily good citizens without inclination to shirk any duty which, if faithfully performed, promises a constructive result for the general benefit of organized society.

Pharmacy a National Asset.

It has been the purpose of the foregoing sketchy pharmaceutical résumé to present to the lay mind a reasonably adequate conception of the important part pharmacy has taken in the upbuilding of the nation, and to implant another thought concerning its importance as a national asset today. While the study of statistics might reveal the millions of dollars invested in the numerous phar-

maceutical enterprises and thus establish an economic value, there are, however, also the elements of scientific achievement, and professional service to be reckoned in. If, therefore, all of the contributing factors are considered without prejudice, there can be no question concerning the right of pharmacy to its place among the indispensable assets of the country.

II.

The Prohibition Amendment.

At the time of adoption of the prohibition amendment, this gigantic and intricate pharmaceutical machine, with its thousands of wheels within wheels and its myriads of operators, was functioning perfectly, with the exception of certain unimportant parts which had developed a slight war imbalance. The immediate interest which manifested itself in relation to the adoption of the prohibition amendment concerned the question of alcohol. The satisfactory adjustment of this question was considered by pharmacists to be vital because alcohol, as such, or in combination, enters into pharmaceutical operations more frequently than any other single drug, and there is no known substitute for it that can be used for medicinal preparations.

Any feeling of alarm that existed in this connection was dispelled, however, when the language of the amendment was published and it was found that it referred entirely to the distribution of liquor for beverage purposes.

Section 1 of the Eighteenth Amendment to the Constitution reads as follows:

> After one year from the ratification of this Article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territories subject to the jurisdiction thereof, for beverage purposes is hereby prohibited.

The language employed in this section, it will be noted, is plain, unequivocal, and states specifically the intent of the amendment: namely, that the "manufacture, sale . . . of intoxicating liquors for *beverage* purposes is hereby prohibited."

The national prohibition act which provides for the enforcement of the prohibition amendment has its purpose stated in its long title and in the following language:

> An act to prohibit intoxicating beverages, and to regulate the manufacture, production, use, and sale of high-proof spirits for other than beverage purposes, and to insure an ample supply of alcohol and promote its use in scientific research and in the development of fuel, dye and other lawful industries.

The absence of ambiguity in the language used in the long title of the Enforcement Act is quite as marked as it is in the amendment itself. The title of the Act states with the utmost clarity its purpose: *"To prohibit intoxicating beverages . . . to insure an ample supply of alcohol and promote its use in scientific research and in the development of fuel, dye and other lawful industries.*

Pharmacists' Efforts to Help.

In the belief that the Enforcement Act meant just what its language implied, its passage through the Houses of Congress was accepted with equanimity, with the exception of the provision which designated pharmacists as the legal distributors of liquor, as such, for medicinal purposes. In the fear, since realized, that this disposition of the liquor problem would exercise a demoralizing influence upon the practice of pharmacy, that part of the Act which legalized it was generally opposed by pharmaceutical organizations. Despite this opposition the provision was written into the law and pharmacists found themselves the legal, sole, and more or less unwilling custodians of intoxicating liquor, distribution of which was subject to the regulations under the Act, which were subsequently promulgated with the approval of the Secretary of the Treasury.

Having failed to divert the distribution of liquor to some other lawful channel, it was hoped that some plan could be worked out whereby a limited number of distributing points might be established, sufficient in number to give adequate service to the sick and also to permit those who desired to avail themselves of the distribution privilege, under the law, to do so. Because of the small percentage of pharmacists who had indicated any inclination to become distributors, this plan seemed to promise success, but it was upset by the public statement of an ambitious revenue official, made soon after the prohibition enactment, to the effect that a large majority of pharmacists had qualified as distributors by taking out "retail liquor dealers" licenses. This statement stampeded a noticeable number into like action with the thought of protecting their business interests from this new competition.

An interesting fact in this connection is that a meeting held two days previous to the date of the above statement and attended by some two hundred representative pharmacists revealed that but fourteen out of this number had qualified as "retail liquor dealers."

It should be stated in explanation of the paradoxical term used above that, in addition to securing a permit and filing an adequate bond under the prohibition law, a pharmacist, in order to qualify as a dispenser of liquor or pure grain alcohol, as such, is required to procure from the Collector of Internal Revenue a Retail Liquor Dealers' license and pay an annual tax of twenty-five dollars.

A second effort to keep the number of liquor-distributing points within reasonable bounds, which was advocated by pharmacists, proposed that permits to dispense intoxicating liquors, as such, be withheld during the first year's business of a newly established concern. It was felt that this plan would discourage those who might be disposed to enter the practice of pharmacy for the sole purpose of capitalizing and abusing the liquor privilege, and that it would in no way interfere with the right of any qualified person to open a new establishment and render full pharmaceutical service to the community from the beginning. The plan was submitted to the Federal Prohibition Office, which gave it lengthy consideration and eventually decided that there was nothing in the Enforcement Act that permitted discrimination between applicants for permits to distribute liquors and, since its agents were bound by the limitations of the law, permits must be granted to all qualified applicants.

The H and I Permits.

A third attempt to control the situation also met with discouragement, and in this connection a word of explanation concerning the effectiveness of the several types of permits is necessary. While the regulations under the Act provide for various classes of permits each having its own special significance, designated by a letter, only two of them relate to this discussion, namely, those which are identified by the letters *H* and *I*. One or the other of these two permits must be secured in order to carry on the practice of pharmacy under the prohibition act.

The possessor of an *H* permit is entitled to withdraw alcohol, whisky, brandy, gin, rum and wines for *use* in compounding pharmaceutical preparations and prescriptions, all of which, when ready

for sale, must be sufficiently medicated to preclude their use for beverage purposes.

The possessor of an *I* permit is entitled to the same privileges, plus the right to *sell* any of the above-mentioned substances as such, without rendering them unfit for beverage purposes, but only on prescriptions written by physicians qualified under the Act, and for medicinal purposes only.

In other words, the *H* permit was designed to provide a lawful method of procuring and using these pharmaceutical essentials in order that pharmacists might continue to function effectively along previously established lines. The *I* permit differs only in that it adds the further privilege of dispensing unmedicated intoxicating liquors for medicinal purposes to holders of properly executed orders issued by qualified physicians.

Having in mind the frailty of human nature and believing that prevention is better than cure, the third move by pharmacists to limit the number of liquor-distributing points involved an effort to encourage a general application for *H* permits. It was assumed, no doubt safely, that a sufficiently large number to meet legitimate demands for medicinal liquors would apply for *I* permits.

This plan also fell flat, for the reason that minor officials in the prohibition department suddenly developed an obsession for placing their personal interpretations upon the meaning of prohibition regulations. Their interpretations were by no means uniform, and this lack of team work in their mental processes brought about a state of considerable confusion. Some officials attributed full effectiveness to *H* permits, others limited them to the withdrawal of alcohol only, and those functioning in one sovereign state during one year required all retail pharmacists who desired to carry on practice to take out *I* permits, automatically creating, willy nilly, a hundred per cent. quota of potential distributors of liquor in that state.

Under these involved conditions there was only one alternative in sight for those who desired to avoid any interruption in their legitimate practice, and that consisted in accepting an *I* permit. Service to the sick is imperative and cannot be delayed pending the outcome of experimental procedure, and for this reason the alternative in the case in the shape of *I* permits was generally accepted.

It should be understood that a pharmacist operating under an *I* permit is a free agent so far as the distribution of liquor is concerned. He may qualify as a distributor by paying an annual tax of

twenty-five dollars and securing the necessary license, or he may refuse to become a distributor and simply operate as under the *H* permit. Under the latter permit he is not entitled to qualify as a retail liquor dealer.

Forcing I Permits Created Liquor Outlets.

Contemplating this situation from the standpoint of strict prohibition enforcement, and that is the only standpoint tenable for the law-abiding American citizen, it would appear in the above connection that a clearer interpretation of the regulations would have had the effect of reducing the number of liquor distributors, actual and potential, materially. While it does not follow that every *I* permittee will necessarily become a distributor of liquor, there can be no controversy concerning the inability of the *H* permittee to qualify as such under his permit. The greater the number, therefore, operating under the *H* permit, the less the temptation. As the temptation is removed, the dangers of abuse diminish and the task of effective prohibition enforcement becomes more simplified.

While it is understood that there is no authority for limiting a qualified applicant to one or the other permit, it does seem unfortunate that those who essayed to establish such an interpretation of the regulations failed to grasp the principle laid down in Section 3, Title 2, of the Act as follows:

> All provisions of this Act shall be liberally construed to the end that the use of intoxicating liquors as a beverage may be prevented.

It may, or may not, be a significant fact that the state referred to above, in which for a time all pharmacists were required to accept *I* permits, acquired some six hundred new so-called drug stores during a period in which 10 per cent. of that number would have represented a normal increase.

"Mushroom" Enterprises.

A convenient loophole through which undesirable persons may wriggle their way and secure at least a foothold upon the pharmaceutical ladder is provided in most states through lack of a law restricting drug store ownership to qualified pharmacists. Practi-

ally all of the states permit any person to own a drug store who has the ambition, and the price to acquire it. If lacking in the necessary legal qualifications to conduct it as such, some one who is qualified can usually be found who is willing to be influenced, for a price, to conduct it according to the predilections of the owner.

Unceasing effort has been put forth by pharmaceutical agencies since the advent of prohibition to discourage admission to the practice of those who profess honorable motives, but whose mercenary impulses are but poorly cloaked by the mantle of pharmacy which they audaciously assume.

The tendency of pseudo-pharmaceutical ventures to multiply, which was engendered by prohibition and does not appear to be controllable under its enforcement, is reflected in both retail and wholesale practice. In the hope of controlling liquor distribution in the wholesale drug field, a ruling was promulgated by the prohibition office which restricted sales of liquor at wholesale to 10 per cent. of the total volume of business. This plan at first glance appeared to provide the desired control and was readily agreed to by the long established wholesale drug houses. As a deterrent to new enterprises, however, it failed, because it did not inspire the slightest feeling of dismay in the breasts of ambitious newcomers, and the increase in number of self-styled wholesale drug concerns throughout the country is as amazing as it is unwarranted by the economic needs.

The ruling concerning the ratio of liquor sales to drug sales in a way assumed the form of a boomerang against the old line houses. The latter have built upon a foundation of service, quality, prestige, and they follow the recognized rules of legitimate merchandising in their business practice. Many of the new enterprises are conducted along lines which ignore all economic law and violate every rule of intelligent merchandising, in their efforts to secure a worth-while volume of general sales upon which to build a business in liquor.

The alluring prospect of fantastic profits upon sales of the latter more than compensate them for the price sacrifices made upon other commodities for the purpose of encouraging an outlet for established lines of merchandise. The existence of many of these "mushroom" enterprises both in the wholesale and retail drug field is often ephemeral, but the injury inflicted upon the calling which they prostituted lives long after them and serves as an uncomfortable thorn in the side of the legitimate practitioner.

Enforcement by Regulation.

One who has closely observed the administration of the prohibition enforcement law until recently has difficulty in avoiding the conclusion that some of the thought and energy which has been directed toward regulating the *authorized* dealer in alcohol, liquors and wines who respects the law might have been more profitably utilized in apprehending and prosecuting the *unauthorized* dealers, who look upon the law as being a joke and its administration a farce.

To be sure, it is necessary to establish a system of control of the substances proscribed under the prohibition act in order that proper supervision may be maintained over production, withdrawal, use and distribution. That obvious requirement, however, would seem to be susceptible of being handled in a business-like way, devoid of intricate and contradictory rules and regulations, and in a manner quite free of implied suspicion of the designs and deeds of those who involuntarily became the objects of regulation without departing from the routine of their lawful and essential occupations.

Admittedly there are those who may abuse the legal privileges which are theirs under the prohibition act, just as they may incur infractions of other laws; but, may not one have confidence in the effectiveness of the laws themselves to provide punishment of the culprits as is contemplated under the American system of jurisprudence? Why, then, make *particeps criminis* of fifty thousand pharmacists and penalize them with restrictive regulations, when but a small percentage of this number—probably "the lower five"—falls from grace? It will not make the other forty-nine thousand odd feel any the more kindly toward prohibition enforcement, nor will it deter for a moment the mind imbued with criminal intent.

Provisions in Law not Utilized.

As an illustration of the lost motion resulting from the application of the system of law enforcement by regulation, the experience with Essence Jamaica Ginger may be cited. It was charged that large quantities of this century-old household remedy were being sold by certain unscrupulous persons to others equally unscrupulous, ostensibly for use for beverage purposes. The Act provides that "any person who shall knowingly sell any of the articles mentioned in paragraph b for use for beverage purposes (which includes Es-

sence Jamaica Ginger) shall be subject to the penalties provided in Section 29 of this title." (Section 4, Title 2.)

Whether this apparently adequate provision in the law was considered ineffective, or too troublesome to apply to the sporadic violators is not evident, but the idea of controlling similar infractions at one stroke was evolved in the prohibition office and made effective by the declaration that Essence Jamaica Ginger was "fit for beverage purposes," and as such it automatically fell under the ban of sale along with whisky, brandy, etc.

Instead, therefore, of utilizing the provisions in the law to punish the comparatively small number of offenders whose greed ran away with their better judgment, the remainder of the fifty thousand practitioners were penalized by peremptory orders to cease forthwith the sale of this household remedy to their hundreds of thousands of innocent patrons, to most of whom the product in question had no other significance than that of being a valuable domestic emergency remedy.

Annoyance Without Compensating Benefits.

Since a pharmacist may himself compound under the prohibition law any of the products which he dispenses, it becomes difficult to comprehend that anyone inclined toward moral strabismus will be moved to obey a regulation when he has plainly shown his contempt for the law under which the regulation is issued. If, therefore, he should fail to obey the regulation just as he disregarded the law, he must be sought out and prosecuted under the law and the circle is complete, since that brings us to the point from which we started—namely, the provision for his prosecution in the law itself.

If the law after all is the thing, it does not seem to be the part of wisdom and certainly is not helpful to the cause of prohibition to use the latter as an instrument by which thousands of potentially good citizens are enmeshed in a maze of regulatory red tape, restriction of action, and which permits their harassment with trivial technicalities and irksome rules which test their patience if not their confidence to the utmost degree. It is probably a safe guess that many substantial but disgruntled citizens, who have lent their support to organizations antagonistic to the cause of prohibition, have done so in protest against the prevailing methods of enforcement rather than in opposition to the principle involved.

Irksome Red Tape.

The network of regulations which has been woven about the legitimate dealer in spirituous products is as intricate and incomprehensible as it appears to be ineffective, in so far as prohibiting the illicit traffic in intoxicating liquor is concerned.

A sixty-four page set of regulations supplemented by a flood of Treasury decisions amended regulations, rulings, pro. mimeographs, pro. circulars, etc., followed in turn by an incessant stream of qualifying communications carrying revisions, interpretations, restrictions and cancellations of orders which were promulgated without being fully digested, all of them subject to varied, autocratic, and sometimes vicious interpretations by the multitude of agents "clothed with brief authority" to enforce the prohibition act, has served to keep the pharmaceutical mind in a state of feverish activity, if not anxiety, for several years past.

Other added activities are involved in complying with sundry requirements such as filing bonds guaranteeing the Government against loss of additional tax collectible upon any alcohol or liquor that might perchance be diverted to beverage use; submitting formulas of own-make preparations containing alcohol; applying for permits; applying for withdrawals; making affidavits, then more affidavits; segregating into designated classes the various preparations manufactured which contain alcohol; keeping detailed records of alcohol consumed in these operations and filing monthly reports of withdrawals and disposition of alcohol and liquors with inventory of stocks on hand.

Detrimental Results.

The necessity for a detailed analysis of pharmaceutical operations involved in the use of alcohol which is required in the monthly reports referred to has had a most detrimental influence upon the continued development of pharmaceutical practice. As stated before, alcohol enters into pharmaceutical operations at every turn. In prescription practice it must be available immediately for the thousand and one purposes to which it only is adapted. It enters into the compounding of hundreds of official preparations that must be kept on hand constantly in order that needed remedies for the relief of the sick and suffering may be furnished promptly. To keep

only an accurate record of the *number* of times alcohol is used during a day in a busy prescription pharmacy would in itself be an uncertain task, and to attempt in addition to segregate its varied uses into classes does not promise accurate results.

Forced by the many other details which have been added to their daily task to seek relief from some quarter, many pharmacists to avoid a certain amount of record-keeping buy the products which they are equipped to make, and others in sheer disgust and following the line of least resistance have laid aside altogether their professional prerogative and are confining their activities mainly to liquor distribution, interspersed with intensive merchandising along department store lines.

Suggested Elimination of Tedious Reports.

Tabulating a monthly report of liquor distribution, compared to keeping a record and furnishing a report of alcohol used in preparing medicines for the sick, is simplicity itself. Liquor may only be dispensed in original bottles and the number of bottles on hand at the end of the month subtracted from the number on hand at the beginning, and acquired during the month, quickly reveals the number sold. Inasmuch as the use of alcohol in certain quantities by pharmacists for preparing medicines is a century-old prerogative. it does seem that a method might be devised under the prohibition act for its continued use in similar quantities for the same purpose which would reduce the alcohol reports of the prescription pharmacist to the simple proportions of those rendered by the liquor distributor at least.

A short step in this direction would be made by requiring reports at intervals of three months in conformity with the present system of figuring withdrawals on a quarterly basis. The involved detail of segregating the consumption of alcohol into numerous classes might also be simplified by reducing the number of classes. The object to be attained by the present plan of classification is to permit balancing the quantity of alcohol withdrawn with the purpose to which it is applied and thereby prevent illicit diversion. It is not conceivable, however, that anyone who did divert his supplies would state the dereliction in his report. Therefore this feature seems to lose its utility except as a device to invite technical violations for statistical use.

Alcohol More Restricted Than Liquor.

There is nothing in the prohibition law that indicates any desire to abolish the legitimate practice of pharmacy. On the contrary, it states specifically that alcohol is to be made available in ample quantity to encourage lawful industry and scientific research. The practice of pharmacy being both a lawful industry and an instrument for scientific research, it would seem a work of supererogation to interfere with the acknowledged need for alcohol, or to hamper its legitimate use with irksome and meticulous rules and regulations.

If the cause of prohibition is safe, and it probably is, under the offer of the prohibition office to permit withdrawal of twelve hundred thousand quarts of whisky annually by physicians for use in emergencies, waiving records and reports, it certainly would not seem to be jeopardized by conceding to pharmacists the obvious right to withdraw and use alcohol in pre-prohibition quantities, subject to reasonable and workable rules and regulations.

If the obsession which dominates some minds that the successful outcome of prohibition enforcement is premised upon a reduction in withdrawals of alcohol can be removed, and attention concentrated upon the murderous illicit traffic in whisky, the cause of prohibition will be advanced and the practice of pharmacy saved.

Valuable Knowledge of Pharmacists.

The plea of pharmacy is only for freedom to exercise its prerogatives, and in defense of its right to live. The consistent attitude of established pharmaceutical interests toward prohibition enforcement has been one of helpfulness. The enormity of the task involved in effectual enforcement appealed strongly to pharmacists because they knew better than any outside of the practice the many ramifications of the channel through which alcoholic medicinal products must pass on their way to the legitimate consumer.

They knew the weak points in the plan of distribution and they knew the strong points which would be subject to attack by those disposed to break down the plan. They knew the legitimate need for alcohol in the past and they knew that the need would continue to exist. They offered this and other information unreservedly, both as good citizens and for the purpose of safeguarding their lawful occupation against demoralization and destruction. They have not

lost hope in spite of their many trials and they still feel confident that the principle of prohibition and the practice of pharmacy can both live and flourish under the same flag.

Ways and Means of Enforcement.

To achieve this purpose they believe

(1) That prohibition enforcement should be conducted along lines conforming to the dignity and importance of the government which launched it.

(2) That the co-operation of all good citizens should be encouraged, not antagonized.

(3) That unwarranted assumption of prerogatives by subordinates in the enforcement division should peremptorily cease.

(4) That swashbuckling methods of enforcement by agents with dime novel soubriquets should be abolished.

(5) That inquisitorial methods have no place in the American system of government.

(6) That the prohibition enactment has not changed the principle that a man is considered innocent until proven guilty by due process of law.

(7) That the work of prohibition enforcement would be facilitated by inclusion in its forces of men of expert pharmaceutical training, endorsed by their state pharmaceutical associations.

(8) In the co-operation of all good citizens for the preservation of American institutions, and to the achievement of this end they pledge their best effort.

In closing this more or less superficial glimpse of American pharmacy and its troubles under prohibition, reference should be made to the fact that the Commissioner of Internal Revenue within the year has taken cognizance of the plight of those concerned and has suggested an Alcohol Advisory Committee representing the various pharmaceutical interests whose co-operation he invites for the purpose of mitigating the present difficulties.

THEOPHRASTUS OF HOHENHEIM, CALLED PARACELSUS.*

By Emil Amberg, M. D., F. A. C. S., Detroit, Mich.

With Vesalius, Paré, Harvey, Borelli, de le Boe, Sydenham, Morgagni and Bichat, Sudhoff [1] mentions Theophrastus of Hohenheim, called Paracelsus, among the founders of the third, our period of medicine. The first period [2] is that of primitive medicine of the old orient and of the classic ancients. It lasted until the time of Galenos. The second period extended from the time of death of Galenos (in 201) to the time of Francis Bacon of Verulam (1561-1626). The apparent anachronism can be explained by the fact that the influence of some of the pioneers mentioned showed itself only later.

During the great time of renaissance, when the world tried to free itself from the bondage of tradition, civilization was influenced by a number of geniuses. There were,[3] *e. g.*, Leonardo da Vinci, Ariosto, Rafael, Columbus, Copernicus, Thomas Moore, Erasmus, Luther, Melanchthon, Rabelais, Vesalius, Cardanus and Theophrastus of Hohenheim called Paracelsus, who stands out in rugged and inspiring boldness. Misjudged for centuries, the real greatness of his intellect and the nobility of his character have been appreciated only in our time. From a Swabian noble family [4] the father of Paracelsus, Wilhelmus of Hohenheim, entered the University of Tuebingen as a medical student in 1482 and practiced later in Einsiedeln, Switzerland, where he married. His wife was of the Ochsner family and their only child, Paracelsus, was born in Einsiedeln in 1493. The father intended to train his son to be a naturalist and named him Theophrastus after Tyrtamos Theophrastus of Eresos, a pupil of Aristotle. The father of Paracelsus was an ardent student of botany and a teacher in the mining school. He personally took charge of the early training of his son and taught him the direct observation of nature and experimental chemistry.

Paracelsus gratefully acknowledged that his father never had forsaken him. He then left his home to undergo his medical study

*Read in abstract before the Wayne County (Michigan) Medical Society, January 9, 1922.

(Reprinted from *American Medicine*, New Series, Vol. XVII, No. 3, pages 145-151, March, 1922.)

in Basel and other places. "I therefore attended the universities for many years, in Germany,[3] in Italy and France, and sought the foundations of medicine, and was not only anxious to devote myself to their doctrines, books and writings, but I wandered further—to Granada, to Lisbon, through Spain, through England, through the Mark (Brandenburg), through Prussia, Lithuania, Poland, Hungary, Transylvania, Croatia, the Wendian Mark (*i. e.*, Lusatia, now a part of Prussia and Saxony), as also other countries not necessary to enumerate. And in all corners and places I industriously and diligently questioned and sought for the true and experienced arts of medicine. And not alone with doctors; but also with barbers. surgeons, learned physicians, women, magicians, who practice that art; with chemists; in the cloisters; with the noble and common, with the wise and the simple. But even then I could not learn to be fundamentally certain—no matter what disease it might be. I pondered over it much—that medicine was an uncertain art not honorably to be followed, an unfair one to hit upon by chance—for one that was cured, ten are ruined."

He received the title of Doctor at Ferrara.[5] In 1526 he settled in Strassburg, in 1527 he was professor of medicine and surgery at the University of Basel, announcing his lectures as *Theophrastus Bombast ex Hohenheim Eremita Utriusque Medicinae Doctor ac Professor.*

June 5, 1527, Paracelsus started his lectures with the following solemn program:[2] Nowadays only few practice medicine successfully. Others want to purify medicine not after the doctrines of the ancients, but of nature itself, in order to remove the contamination caused by the barbarians, and the grave errors. People attach themselves too anxiously to the words of Hippocrates, Galen and Avicenna. The physician is not created by titles, oratory, science of language and bookstudy, but by the comprehension of the secrets of nature.

He would teach two hours daily practical and theoretical medicine according to his own work for which he has not gone a-begging to Hippocrates or Galen, but which he has based on the highest authority, his own experience and elaboration. When proofs are required, experiments and reasoning will be offered not quotations from authorities. *Summa doctrix experientia—experimenta ac ratio auctorum loco suffragantur.* Humores which have been accepted as causes of diseases will not be referred to. They have

proven to be an obstacle to the understanding of these diseases, their causes and their course.

It must be added that Paracelsus was not antagonistic to Hippocrates; on the contrary he preferred to continue the methods of direct observation as practiced by Hippocrates. He claimed that Hippocrates was the only one who still held good, but that he was misunderstood.

The physicians at the time of Paracelsus followed strictly the Galenic system as it had passed from generation to generation. It is the immortal merit of Paracelsus that, from the very beginning of his medical studies, he took a decided stand against the whole Galenic system and worn-out traditions in general. This, of course, brought him in conflict with practically the whole profession. The literature about Paracelsus is very instructive and inspiring, especially concerning this phase of his life, which the very short time at my disposal does not permit me to treat in detail. The climax was reached during the time of his professorship in Basel. A rich patient unsuccessfully treated by others had promised him a hundred gulden and paid only six. Paracelsus who did extraordinarily much for the poor had to insist on his right because a previous similar occurrence had been exploited by his enemies to ridicule him.

Paracelsus sued the patient, but the judges decided against him. Paracelsus then attacked the judges, and a warrant was issued for his arrest. It was the final climax to the tremendous fight which was waging between the two schools, Paracelsus and the antiquated systems of Galenus and Avicenna. In serene confidence, Paracelsus thus challenges his opponents:[3] "You must follow after me—not I after you—Ye after me, Avicenna, Galen, Rhasis, Montagnana, Mesue, etc. After me and not I after you—Ye of Paris, ye of Montpellier, ye of Swabia, ye of Meissen, ye of Cologne, ye of Vienna, and those who are on the Danube and the Rhine, ye islands of the sea—thou Italia, thou Dalmatia, thou Athens, thou Greece, thou Arabia, thou Israelita, after me and not I after you—I shall be monarch and mine will be the monarchy."

At one time he said,[3] "I may well rejoice that rascals are my enemies—for the truth has no enemies but liars. . . . I need lay on no armor against you—no corselet, for you are not so learned nor experienced that you can disprove my least letter. Could I protect my bald head from the flies as easily as I can my monarchy,

and were Milan as safe from its enemies as I from you, neither Swiss nor foot-soldiers could gain entrance."

Paracelsus was not soft in his language.[3] "My style pleases me very well. In order to offer a defense for my strange fashion and how it is to be understood, know this—by nature I am not woven fine—it is not the fashion of my land that one attains anything by spinning silk. Nor are we reared on figs or mead or wheaten bread, but on cheese, milk and oaten bread. That does not make subtle fellows."

His reputation did not suffer after he left Basel. He kept the friendship of the savants like Erasmus of Rotterdam, and enjoyed a large practice. He[4] practiced in Alsace, then in Esslingen where he also installed his laboratory. Then he went to Swabia and Franken. During his travels he constantly kept on writing. When he was in the midst of his work he did not get out of his clothes for weeks. He then slept scarcely three hours in boots and spurs. He was very painstaking in his writings. When the city council of Nuernberg forbade the printing of some of his writings he said that[4] "One prints things that the truth may come to light, that his writings did not concern the government, princes, lords, magistrate, but only the frauds in medicine, so that the common people, rich and poor, should not be cheated." He did original work and told the physician, "You must not be Aristotelici, not Platonici, not of the Scots of Scots nor Alberts; your own experience should be full and mighty authorities." His motto was *alterius non sit, qui suus esse potest*—"Nobody shall be the servant of others who can be himself."

Sudhoff[3] records some nineteen editions of the Greater Surgery by the close of the sixteenth century, in the German, French, Latin and Dutch languages; other works shared in somewhat less degree in this popularity.

He was called[4] to the bedside of noble lords and rich patricians. His traces from 1539-1541 are found in Augsburg, Munich, Gratz, in Austria-Silesia, Breslau, Vienna and at last in Salzburg to which place he was called by the reigning prince archbishop Ernst, a friend and patron of the natural sciences. In Salzburg he died September 24, 1541.

The archbishop,[4] it is reported, ordered that the funeral of the famous physician and savant should be extraordinarily solemn. On his tombstone is inscribed,[3] "Here is buried Philippus Theophrastus,

distinguished Doctor of Medicine, who with wonderful art cured dire wounds, leprosy and other contagious diseases of the body, and who gave to the poor the goods which he obtained and accumulated. In the year of our Lord 1541, the 24th of September, he exchanged life for death."

The following are a few comments on Paracelsus:

I. H. Baas,[6] 1896, says he was the forerunner of Bacon. His physiotherapeutic aim and his understanding based on clear observation and deep study of nature led him to say, "Any surgeon must know that it is not he who cures, but it is the balm in the body that cures, and what thou art good for, surgeon, is that thou protectst and supportst nature at the seat of injury." He condemned the collusion of the pharmacists and the physicians and wrote short prescriptions, not the 40-60 items in the same as it was the rule. "The longer the writing the less understanding, the longer the prescription the less virtue." Baas claims that Theophrastus is one of the most ingenious and fascinating, most original and most gifted personalities in the whole history of medicine, of the greatest virtues and mistakes, full of nonsense besides the greatest clear-mindedness, full of goodness of heart and honesty, depth of intuition and richness of mind, of fighting spirit, courage and energy, a true son of his soil and of his time. According to Sudhoff, Paracelsus was the first who wrote about occupational diseases, by describing mercury and lead poisoning and a peculiar group of tartaric diseases which resulted through deposits of uneliminated material (gout, stones in the bladder and gallstones, sciatica, etc.) which could best be recognized by precipitates in the urine.

He demanded cleanliness in treating wounds, a simple dressing and a regulated conduct of life. He knows tetanus, sepsis and pyemia, wound-diphtheria with accompanying diphtheria of the throat and accidental erysipelas. He blames the bad bandaging of the old surgery for the "water in the joints"; ulcers he treats with mineral remedies. He condemns the rough methods of setting fractures and constructed an ingenious apparatus for those of the lower extremity. He knows primary and secondary syphilis, its heredity, and used as the first mercury internally. "There are only few, and these rather unimportant, rules in the most modern therapy of syphilis," says Proksch, "of which Paracelsus did not speak."

The thought[4] that a disease could be fought and cured by the agent producing the disease was not unknown to Paracelsus, *e. g.*, a snakebite by snakepoison. He also[4] used suggestive therapy.

Garrison,[7] 1914, says: "Far in advance of his time, he discarded Galenism, and taught physicians to accept chemical therapeutics; he attacked witchcraft and the strolling mountebanks, he opposed the silly uromancy and uroscopy, he was the first to write on miners' (occupation) diseases and the first to establish a correlation between cretinism and endemic goiter; almost the only asepsist between Monderille and Lister (Semmelweis exempted, E. A.) he taught that nature (the natural balsam) heals, wounds and not officious meddling; he introduced mineral baths, and was one of the first to analyze them; he made opium (laudanum), mercury, lead, sulphur, iron, arsenic, copper sulphate (called the *specificum purgans Paracelsi*) a part of the pharmacopeia, and regarded zinc as an elementary substance; he distinguished alum from ferrous sulphate and demonstrated the iron content of water by means of gallic acid."

The philosopher Sigwarts judges Paracelsus as follows:[4] "Paracelsus is one of the most original and most impressive figures of a fermenting time. For all energetic and progressive minds the password of the time was war against the unfertile traditions, renovation of the intellectual life in all branches and the return of religious belief and science to the true and original source."

Stillman[3] says: "The great service of Paracelsus to chemistry was not in any epoch-making discovery nor in any development of theory of permanent value, but in opening a new field for chemical activity in the application of chemistry to the preparation of mineral and vegetable remedies." "The influence of Paracelsus upon chemistry was epoch-making. By pointing out a rational and promising field for chemical activity and by his own successful application of chemically prepared remedies he inaugurated a movement which has continued without interruption and with increasing importance to the present day." "Historians of chemistry have generally recognized the important influence of Paracelsus upon the development of chemical science in emphasizing its importance to medicine and pharmacology." He was the first[2] to teach the separation of the efficacious ingredients from drugs and to use them in tinctures and extracts.

A few sayings of Paracelsus may be added: "It is the duty of the physician," he said, "to learn constantly." That there was no end to medicine, that others will find much unknown to him and that he gladly would recognize anybody who knows more than he. He made the following vow: "To perfect my medical knowl-

edge, to remonstrate against all false medical doctrines. Thus I love my patients, any single patient more than my own self, to keep my eyes open constantly and to judge according to what I see. Not to give any medicine without knowing why, not accept any compensation unless I earn it, not to trust any pharmacist, not to take any undue advantage of a child, not to guess but to know . . . where nature gives out not to continue to try, to advise those in distress and of the melancholic mind. . . ."

Concerning the poor insane people [4] who were frequently treated inhumanely and cruelly at that time he said: "In the misery in which you find yourself, in that misery we will protect you and ourselves and take care of you, we will take your yoke and your load upon our shoulders and pray to God, our Saviour, to release you."

Hohenheim [4] vigorously denounced students "who did not want to study until they became masters, who wanted to fly before their wings had grown, and he denounced those false fellows who do not use their common sense in their acquired arts, who use one saddle to ride all horses and thereby do more harm than good. What he himself used with his patients in anxiety the pupils carried away on light wings before the pan had cooled off." "He claims such a man who left school too soon, is like a thief."

"Now take notice,[3] that among all the arts and professions of mankind God most loves the physician and He commands and ordains him. Therefore as the physician is so preferred and distinguished by God, he must be no hypocrite,[3] no old woman, no hangman, no liar, no trifler, but a real man must he be." "Talking, sweet speech, flattering is of the mouth, but to help and be useful, is of the heart." "Loyalty demands of the physician that he continue to learn incessantly, that he investigate and enrich his knowledge." "Experience begins in youth and continues into old age until death." He told his students: "Not ten hours pass that one does not learn." "Remember that there is no greater love asked from anybody than from the physician."

Speaking [4] of the superstition of the people who foretell the character and destiny of a child by the constellation of the stars at the hour of birth Theophrastus says: "The child does not need a star nor a planet—its planet and its star is its mother."

Time forbids to even touch upon the extensive theological writings of Paracelsus. He called himself a doctor also of the Holy Scripture. His independence of thought is most remarkable. I

cannot refrain to quote a remark he made concerning society: "Not nobility [4] shall be, not beggary. He asks for equal distribution of the land, not as property but to be cultivated. When the population increases a new distribution shall take place. Of a great profit nobody shall keep for himself more than he needs. If anybody makes so much that it is sufficient for twenty, even if it is done legally, it is against brotherly love and Divine Providence. It causes others to go begging or become thieves. If anybody makes a lucky find in the mines he shall not use it for his own enrichment, but he shall share it with others. Also the government and the emperor shall not take from the common treasury more than is absolutely necessary. The cities shall not build sumptuous city halls and let the poor live in tumbling huts."

In 1909, on the 368th anniversary of the death of Hohenheim, some physicians [8] met at the epitaph of Hohenheim in the vestibule of the Church of St. Sebastian in Salzburg and viewed the skull and other parts of his skeleton. Sudhoff, the famous medical historian who wrote extensively about Paracelsus, spoke as follows: ". . . Into the simple casket we have again deposited the earthly remains of the restless wanderer who roamed over God's country and whose fate was fulfilled here in the valley of the Salzach. With reverence and emotion we held in our hands the fragile housing of his mighty mind the working of which was felt in the whole world. We deposit laurels and roses on his tomb. Not only did the seeds of his mind sprout, as he modestly hoped, but they blossomed and their fragrance penetrated the realms of the world, a fragrance which is noticed to this day in the natural sciences and medicine. He has been victorious on the whole front as pioneer of a science free from the chains of authority, based purely on observation just as he predicted, sure of his ground, that it would survive after his death, 'without his body.'" "Truly [6] I shall accomplish more against you after my death than before." Considering the importance of Paracelsus we must try to visualize conditions and events of the middle ages. We must not expect to see a man rise disconnected from his surroundings endowed with the viewpoint of our time. That would be entirely unnatural. Judging Paracelsus in the spirit of history we stand in humble admiration before the memory of a great physician, scientist, teacher, reformer and philosopher, of a man of a colossal mind and a kind heart. "Take notice," says Paracelsus,[2] "that the patient must be on the physician's mind day and

night. The physician must always think of him, and he must put his whole power of reasoning and his judgment deliberately in the service of his patient," for "In the heart grows the physician, he comes from God, he is of the natural light, the experience." "The most sublime principle in medicine is love."

REFERENCES.

1. SUDHOFF: Period of Development of the Healing Art and Science, in abstract, *Munich Medical Weekly*, November 25, 1921.
2. MEYER—STEINEG and KARL SUDHOFF: Review of the History of Medicine, June, 1921.
3. JOHN MAXSON STILLMAN: Theophrastus Bombastus von Hohenheim, called Paracelsus, His Personality and Influence as Physician, Chemist and Reformer, 1920. The Open Court Publishing Company, Chicago and London.
4. R. JULIUS HARTMANN: Theophrast von Hohenheim, 1904.
5. EHRICH EBSTEIN: Physicians' letters of four centuries, Berlin, 1920.
6. I. H. BAAS: Historical Development of the Medical Profession and Medical Sciences, 1896, also American Edition, 1910 (Handerson).
7. FIELDING H. GARRISON: Introduction to the History of Medicine, 1914.
8. Transactions of the Society of German Naturalists and Physicians, 1910.

ADVENTURE, ROMANCE AND SCIENCE.*[1]

Man has struggled up a long trail from the past, leaving many competitors extinct along the way, and stands on the high peak of civilization that we enjoy today. Even in the old stone age there was plenty of adventure, with perhaps a little romance now and then—yes, and science, too. From the glimpses that ancient documents give into what went on in times long before they were written, and from conditions that obtain among primitive peoples today, it seems probable that there have always been scientists among men. These scientists were, and are, peculiar personalities that wanted to know about things. Even today they are often looked upon by many of their companions as men of "authority" and at times treated with respect.

*Reprinted from *Science*.

[1] Presidential address before the Wisconsin Chapter of Sigma Xi, May 2, 1923.

In his life cycle every man roughly recapitulates the past, and (alas!) probably the future, history of the human race. This recapitulation is apparent in many ways, but, as civilized man is judged chiefly by his mind, the present discussion will be confined to mental qualities. A child sucks, feels and views his little world with wonder and admiration; thrills with new sensations—gaining in experience day by day. After a time he finds that he knows something, and becomes a delighted critic of his father's table manners and his little sister's English. Approaching maturity, he wants to do something—just what is uncertain—but something must be done. Man has an instinctive urge for a place in the world. Then the golden age comes—the man finds out what the greatest thing in the world is and begins his life work. He trains and works and looks for responsibility and plans, and—if Fortune smiles may meet with success. After a life spent in labor, the man finds that he is not as important as he thought in the beginning. Then he takes a little time off now and then to enjoy himself, and sometimes develops a certain degree of toleration for others who are trying to live a life. Finally, man spends his old age feeling more or less apologetic for living at all. But hope never seems to die in the human breast and the old man, though left behind by the next generation and in his soul convinced of his perfect uselessness, does not despair. In fact, he gets considerable satisfaction by telling the rising generation about what he claims is a grand life that he has lived, but what is really such a life as he hopes some of his patient advisees will try to live. Thus the cycle goes round.

The army intelligence tests made it apparent to all the world that there are many eccentrics in the cycle of life. Some personalities are arrested in youth. Every one has known persons who went through their lives thrillfully suckling, handling or viewing each experience—and then waiting for something else. These poor souls of course never attain a place in the world. Others miss their place because they do not earn it, but have a pseudo-place given them by Fortune, and they therefore skip from youth to the enjoyment of the pleasures that normally come after the struggles associated with maturity. Some limited personalities are obliged to begin what should be their maturity with the apologies of old age.

It is indeed fitting that after all these ages and chances for failure we should be felicitated on being here tonight—mature, more or less sane personalities; most of us just beginning careers as scien-

tists. We have every reason to feel proud of the human race for its successful domination of the earth and we may rejoice that we of all the people are the personalities endowed with the appropriate qualities to take up work in the greatest field for human endeavor—science.

I might speak to you in an inspiring way concerning our duty to co-operate or discuss the value of science or the grandeur of research. I have talked the matter over with my wife and she assures me that I am enough of a hypocrite to do any of these things well. Better still, and easier, I might by appropriate arguments show what is wrong with science or religion and point out how we might all live better and more scientific lives. However, I am not going to do any of these things, but only make a few more or less irrelevant remarks concerning science and scientists.

President E. A. Birge in a recent address maintained that there are two types of scientists: (1) those who want to know about the world, and (2) those who want to make the world serve them, Darwin and Pasteur bein cited as examples of their respective classes. In my opinion there are at least two other classes of persons that call themselves scientists: (3) politicians, and (4) those who are having a good time. All these classes, with the possible exception of the last, furnish their quota of men who are an honor to science. The inquisitive individuals with unquenchable thirsts for knowledge make most of the discoveries; the practical minds make nature an increasingly valuable servant of man; the politicians hold the offices in scientific societies, appoint the fellows and exercise other power-satisfying functions; the joy-riders of science have a good time. My remarks tonight will be primarily to and for the last class. What opportunities does science offer for enjoying life?

In his delightful work on "The Pleasures of Life" Lubbock says:

> "The world would be better and brighter if our teachers would dwell on the Duty of Happiness as well as on the Happiness of Duty; for we ought to be as cheerful as we can, if only because to be happy ourselves, is a most effective contribution to the happiness of others."

The words of such an authority leave no doubt that happiness is both altruistic and scientific. But there are of course various kinds of pleasures, and scientists are undoubtedly worthy of the best.

Of all the thrills that man may feel, there are none that have the glamor of adventure and romance.

There are many who feel that Don Quixote, Captain Kidd, Pizarro and other well-known adventurers had all the adventures worth having and that in this modern, do-it-with-electricity and say-it-with-flowers world there are no adventures left that are worth having. There is also a feeling that romance ended with the passing of crusades or that romance is associated with the chinning of fair maids down knotted bed sheets into the arms of poor but worthy lovers, and that Douglas Fairbanks has it syndicated. To convince such doubtful spirits let me quote from the letter that Ross wrote from India after his long struggle to prove that the mosquito transmitted malaria:[2]

> "But now, in order to ensure at least definite negative results, redoubled care was taken; almost every cell was examined, even the integument and the legs were not neglected; the evacuations of the insects found in bottles, and the contents of the intestine were scrupulously searched; at the end of the first examination staining reagents were often run through the preparation and it was searched again with care. The work, which was continued from 8 A. M. to 3 or 4 P. M. with a short interval for breakfast,[3] was most exhausting and so blinding that I could scarcely see afterwards, and the difficulty was increased by the fact that my microscope was almost worn out, the screws being rusted with sweat from my hands and forehead and my only remaining eyepiece being cracked, while swarms of flies persecuted me at their pleasure as I sat with both hands engaged at the instrument. As the year had been almost rainless (it was the first year of plague and famine) the heat was almost intolerable, and a punkah could not be used for fear of injuring the delicate dissections. Fortunately my invaluable oil-immersion object glass remained good.
>
> "Toward the middle of August I had exhaustively searched numerous grey mosquitos, and a few brindled ones. The results were absolutely negative; the insects contained nothing whatever. . . . On August 20 I had two remaining insects, both living. Both had been fed on the 16th instant. I had much work to do with other mosquitos, and was not able to attend to these until late in the afternoon, when my sight had become very fatigued. The seventh dappled-winged mosquito was then successfully dissected. Every cell was searched and

[2] Boyce, R. W., 1910: "Mosquito or Man?" London, xvi + 280.

[3] In the tropics "coffee" is served in the morning and "breakfast" about noon.

to my intense disappointment nothing whatever was found, until I came to the insect's stomach. Here, however, just as I was about to abandon the examination, I saw a very delicate circular cell, apparently lying amongst the ordinary cells of the organ, and scarcely distinguishable from them. Almost instinctively I felt that here was something new. On looking further, another and another and another similar object presented itself. I now focused the lens carefully on one of these, and found that it contained a few minute granules of some black substance, exactly like the pigment of the parasite of malaria. I counted altogether twelve of these cells in the insect, but was so tired with work, and had been so often disappointed before, that I did not at the moment recognize the value of the observation. After mounting the specimen I went home and slept for nearly an hour. On waking, my first thought was that the problem was solved, and so it was.

"The mind long engaged with a single problem often acquires a kind of prophetic insight, apparently stronger than reason, which tells the truth, though the actual arguments may look feeble enough when put upon paper. Such an insight is mainly based, I suppose, on a concentration of small probabilities, each of which may have little weight in itself; but in this case, at all events, the insight was there, and spoke the truth."

Oh, boy! Is this adventure? Is this romance?

My friend, Professor H. C. Cowles, recently had an enjoyable experience. Years ago, Cowles had a lot of fun determining what relation the growth rings in tree trunks and the general shape of trees had to wet and dry ground and to rain and drought. Recently the United States sued some lumbermen in Arkansas for cutting timber that did not belong to them. In court the culprits claimed that they had acquired rights by the purchase of claims from early settlers, who had lived on the shore of a lake that dried up about 1840. The whole case hinged on whether there had been a lake or not. Well, Cowles went down there and proved scientifically and conclusively, using cypress trees and stumps as evidence, that there had not been any lake present for at least 150 years. The Government got its money all right and incidentally (just to make the joke complete) Cowles got his. If there is any man on earth who has a good time, it is Cowles.

The young man in science says: What are my opportunities? What can science do for me? It is my privilege to point out to him that scientists are a picked, unusual, privileged lot of people, who

are much superior and enjoy superior opportunities to those in any other walk of life.

For example, the broker comes home at night and says:

"Friend wife, the lambs have been swarming this week and I brought home a couple of pearl necklaces. If you do not want them just take them back to Spiffany's and exchange them for something else."

"Thank you so much," says the wife.

The scientist returns to his joyful home and says:

"My dear, I have received notice that the Finnish Society for the Discovery of Paleolithic Artefacts has elected me to honorary membership."

"Is that not fine? I am so proud!" says the wife. "I have had a pleasant day, too. I am making over my wedding gown and it is going to look real nice. By the way, John's shoes are all worn out." [4]

A prominent scientist has recently published a spirited resentment and disgustatory against American men of science.[5] This man can not sleep because scientists do not demand and get the money that they really earn. He claims that scientists really contribute all the big ideas to commerce and get little or nothing in return. In fact scientists are often actually obliged to beg for a little money in order to enjoy themselves doing research. This writer has, I feel, missed the point of science. The basis for all *social* procedure is *custom*, and while a man goes into science to make discoveries, help his fellows, manage other scientists or even to have a good time, he *never* goes into science to make money. It is not done; that's all. If a scientist tried to do such a thing, he would of course be "impure." To be sure, a scientist can not be blamed if he incidentally does earn a little money through no fault of his own, but to start out maliciously to do it is scandalous. As a reward for going without money, scientists enjoy peculiar social privileges that are more or less associated with the fact that they are not concerned primarily with making a modest or a magnificent living, but with the increase of knowledge. The opportunity to think free thoughts, to know and discover are worth more than money to a scientist.

[4] There is more of this dialogue, but, as much of it has no direct bearing on science, I do not quote in full, feeling that enough has been rendered to give the "atmosphere" which is more or less familiar to scientists.

[5] *Sci. Mo.*, 14: 567-577.

Now, I feel that I ought to admonish the young scientists that they, being of the elect of the earth, should be dignified and moderate in all things. They should in any and all joyful pursuits of course have a good time, but also remember that there are persons in the world who wish to be treated with respect and many who wish to sleep. A young Californian hurt the feelings of a lot of thoroughly scientific geneticists by crassly improving a considerable number of plants in order to help out some common horticultural friends of his. A scientist in New York has not only grossly offended a number of his colleagues by refusing to accept certain old traditions, but during one of his joyrides actually threw mud at the image of God. Such unnecessary occurrences are of course regretted by all, and should be avoided because they are likely to give science a bad name.

Witmer[6] says: "Intelligence is the ability to solve new problems. . . . Education is the device of civilization to keep from encountering new problems." A scientist lives largely on ideas. The late John O. Reed once said of one of his colleagues: "I do not particularly mind him, because I know that he really does not think. He only thinks that he thinks." Any one who reads scientific journals soon learns that a certain proportion of the scientific world belongs in the same class with Dean Reed's friend. But, after all, one of the fine things about the scientific attitude of mind is that those who have it think what they please, without fear or prejudice or self-interest. Facts are facts. They require no apologies. Scientific spirit is bound at times to lead those who possess it into conflict with authority and established institutions. But it can not be suppressed. Science is always right because it seeks only for truth, and truth hurts no one. Unfortunately, scientists are not always right.

A scientist has his circulating medium in problems. He deals in and develops problems as a broker deals in stocks and bonds. When his problems are completed he "sells" them to the scientific world by publication, usually at his own expense. For a scientist there is no joy like that of working in his chosen field. Holmes said: "What have we to do with time but fill it up with labor?" To work, to know, to discover and create—for a scientist there is nothing beyond this!

A "real" or "pure" scientist can have little pleasure from life if

[6] *Sci. Mo.*, 15: 57.

he begins his career by craftily seeking out the best "field" or "opportunity." Modern genetics tells us that we are preordained to be osteocephs or geniuses. If one works and worries day and night for forty years on what he loves most, he may amount to something, and he may not. Genetics alone knows and it won't tell. At least we can enjoy ourselves. The greatest thing any man can do for science is to respect himself, love his work—and keep working. I wish you scientists a long and happy life—adventurous and romantic.

A. S. Pearse.

University of Wisconsin.

SLAVES OF THE LAMP OF SCIENCE.*

Under the wild aurora, where shimmering ghost fires glow,
Where the sunbeams glitter at midnight on everlasting snow;
Where the muskox browse on the tundra; where the seal and the killer whale
Play hide and seek in the northern ice, and the frost fiends ride on the gale—
Country of cold eternal; home of the Eskimo;
It is there if you seek, you will find us—far as a man can go!

Slaves of the Lamp of Science, forever and ever we roam,
With God's blue sky for a roof tree, and God's green earth for a home.
Astride of the hot equator, where the tropic jungles stream—
Where the molten wings of the butterflies slip by like a softened dream;
Where death lurks grim in the palm fronds; where fever basks in the flowers;
Where the jaguar prowls, and the hell-mouthed snakes are close companions of ours.

Little brown savage headsmen—blowguns, poison and spears—
They hold no power to harm our kind, we who have lost our fears.
Slaves of the Lamp of Science, we carry no gun or knife,
For he need not heed the arrow's speed who has nothing to lose but his life.

*Alanson Skinner in *Milwaukee Sentinel.*

Why do we travel, you ask me? Why do we journey far?
Go, beg the comets to tell you the why of the falling star;
Whistle the ranging coyote; speak to the startled deer—
And your answer from these will be but the breeze that blows in your empty ear.

Slaves of the Lamp of Science! And, oh, but our task is hard.
It has brought us nothing of riches, but foreheads wrinkled and scarred.
We are the earth's last gypsies—we are her roaming seed;
When her uttermost covert is ended, then falls the last of our breed.
But we live or we die for a purpose, and who can gainsay us then,
Who live for the joy of creating the understanding of men?

MEDICAL AND PHARMACEUTICAL NOTES

THE CAUSE OF CANCER.—That cancer is in some cases and may be in all cases due to irritation set up by parasites of microscopic size, the irritation acting upon an organ or organs unable to withstand it because of inherited or acquired weakness is the judgment of Dr. Erwin F. Smith, chief plant pathologst of the United States Department of Agriculture. His opinion is the result of a long review of the present knowledge of cancer.

Dr. Smith attracted great attention from students of the cancer problem a few years ago when he demonstrated that the crown gall of plants, a disease closely paralleling animal and human cancers, could be experimentally transmitted from plant to plant by means of pure cultures of a micro-organism and that the symptoms were due to substances excreted by the parasite. Since then he has continued his work and has now become convinced that human cancers are in all probability due to parasitic infection, even though no parasite causing human cancer has as yet been found.—*Science Service.*

THE IODIMETRIC DETERMINATION OF SUGARS.—The aldoses, *e. g.*, dextrose and lactose, are quantitatively converted to the corresponding monobasic acids by iodine in alkaline solution at ordi-

nary temperature, provided the proportions of alkali and iodine to sugar are suitably controlled. The slight oxidation of sucrose and levulose found by other observers is confirmed, and the extent of this action is shown to depend considerably on time and temperature of reaction as well as on the proportions of iodine and alkali used. Using standard conditions it is possible to determine sucrose accurately in mixtures by titration before and after inversion, but the determination of other sugars is liable to be affected by non-sugar-reducing substances. The method is so convenient, however, that it recommends itself technically for approximate determination of invert sugar.—C. L. HINTON, F. I. C., and T. MACARA, F. I. C. (*Pharm. Jour.*)

NEW TEST FOR DISTINGUISHING CASTOR OIL FROM OTHER OILS AND DETERMINING ITS PURITY.—The test is based on the following facts: Ordinary soap solutions are alkaline to phenolphthalein. On titration with standard acid solution a point is reached at which a state of equilibrium exists and the pink color disappears. The amount of acid required increases with the dilution up to about 1 part in 150 or higher, at which point it becomes practically constant. With soaps of oleic, palmitic, and stearic acids, and soaps from oils composed of these acids, the figures are equivalent to approximately half the total combined alkali. With castor oil soap it is only 3 to 11 per cent. of the total. Five gms. of the oil to be examined are saponified with alcoholic potassium hydroxide, neutralized, evaporated to remove alcohol, made up to 100 cc., 10 cc. being diluted with 250 cc. of neutral distilled water and titrated with hydrochloric acid in presence of phenolphthalein. Castor oil gave figures varying between 4.8 and 7.9, and figures are given in the paper for a number of fats and oils and rosin in each case very much higher than for castor oil.—H. B. STOCKS, F. I. C. (*Pharm. Jour.*)

ISOPROPANOL—A SUBSTITUTE FOR ALCOHOL.—Isopropanol, a liquid which may be obtained from natural gas or as a by-product in the refining of petroleum, is now heralded as a substitute for alcohol, as a solvent in medical and pharmaceutical preparations. It may be produced cheaper than alcohol, and it has, so far as has been ascertained, no bad effect upon the human organism when taken internally or applied to the skin.

Isopropanol is a colorless liquid, with only a slight odor when pure, and with a boiling point of from 81 to 83 degrees Centigrade, or a little above that of alcohol. Chemically, it also is a member of the alcohol family to which ethyl-alcohol belongs, but unlike it it cannot be made by any known method of fermentation. It mixes with water in all proportions and freely dissolves volatile oils, resins, many inorganic bodies and a large number of organic compounds.

For preparing medicines it has an almost unlimited field. A series of standard pharmaceuticals has been prepared and kept under observation for a long period without showing any change either in appearance or therapeutic value. These include soap, liniment, spirit of camphor, aromatic spirit of ammonia, tincture of iodine, and many others. It may also be used for preparing mouth washes and other toilet preparations.

Its physiological effect shows it to be a germicide and disinfectant of a quality superior to ethyl-alcohol. It appears to be harmless to animals or men when ingested in quantities comparable to those which would follow its use as a medicinal solvent. It has no effect on the optical system such as wood alcohol has. It has already been used in hospitals for external applications and for rubs and baths without any injurious effect being noted.

Isopropanol is now being made in commercial quantities at less than half the cost of tax-paid ethyl-alcohol. Its fields of usefulness are many and varied, and in addition to its solvent and preservative properties it enjoys the advantage of unrestricted sale in that it is not affected by the mass of regulations and difficulties incident thereto that now hamper the handling of ethyl-alcohol.

NEWS ITEMS AND PERSONAL NOTES

A Rare and Valuable Medical Book Once Owned by William Penn, Acquired by the Library of the Philadelphia College of Pharmacy and Science.—At the October meeting of the Board of Trustees of the Philadelphia College of Pharmacy and Science, there was presented by Mrs. Elizabeth B. Remington, widow of the late Professor Joseph P. Remington, for many years Dean

and Professor of Pharmacy at the College, a book which had been in his library, and has long been coveted by local historians and antiquarians.

It is a medical work, entitled, "The Compleat Chymical Dispensatory," written in Latin by Dr. John Schroder and Englished by William Rowland. Printed by John Darby in 1669.

It is a small folio of 545 pages beautifully bound in sheep by Clarke and Bedford, London.

This book was originally owned by William Penn, as evidenced by his bookplate opposite the title page and his characteristically autographed initials on the title page, "W. P. 92," evidently showing the date of its acquisition and two other autographed initials, one on page 545 in the body of the text, and one on the final page.

It contains a chapter concerning the influences of the stars on the human body and its functions, and another with directions for gathering herbs and other medicaments under the auspicious stellar and planetary influences.

If William Penn used this book in his own family practice, he must have subjected himself and his kin to some terrible doses. Among the medicines described in glowing terms and evidently in good repute at that time are moss from a dead man's skull, the flesh of a red-headed man who has died a violent death, bedbugs, lice, flies, serpents and other substances even more revolting.

The book will be kept in the fireproof safe in the College library and may be seen upon application to the librarian.

At the series of lectures held in connection with the post-graduate course at the University of Buffalo School of Medicine, a lecture was delivered by Dr. Paul S. Pittinger, of the Mulford Laboratories, on the "Accurate Therapeutics Based on Drug Standardization."

The lecture was illustrated by a number of physiological tests, and emphasis laid on the importance to physicians of employing drugs only of known definite standards.

BOOK REVIEWS

CHEMISTRY OF TODAY. By P. G. Bull, M. A. (Oxon). With over 150 Illustrations and Diagrams. Extra Crown, 8vo., 311 pp. London, Seely, Service & Co., Limited, and Philadelphia, J. B. Lippincott Co.

This is a new volume of "The Science of Today" series. The mysteries of chemistry are lucidly explained in a popular and interesting manner. It is not in any sense a textbook, but is an attempt to give an account of the less abstruse facts of modern chemistry in popular language and is entirely free from all technical terms, so that it may be understood by all. The work is a companion volume to an excellent series of books on popular science, and the issue of this series is a sign of the times in which we live.

From the twenty-six chapters of the book we like to call special attention to the following ones: I. Alchemy and the Dawn of Chemistry; III. The Chemical Elements; VI. The Air We Breathe; IX. The Story of Flames; XVI. The Romance of Radium; XVIII. The Wonders of the Spectroscope; XXI. The Story of Carbon Compounds; XXII. Chemistry in Daily Life; XXV. Recent Discoveries.

Among the many excellent illustrations the following are noteworthy: Bombarding the Atom; An Alchemist's Laboratory; Helium in Airships; Coal-Tar Dyes; Production of Diamonds; A Living Fly Trap; Liquid Air as an Explosive.

It is a book well worth reading.

OTTO RAUBENHEIMER, Ph. M.

NURSERY GUIDE. By Louis W. Sauer, M. A., M. D. Illustrated. 12 mo., 188 pp. Cloth, $1.75. St. Louis, C. V. Mosby Co., 1923.

The care, nourishment, and ills of infants are so different from those of children and adults that they deserve special consideration. Therefore the book before us. By providing proper care and nourishment, the ills of infancy are greatly reduced. Food, more than any other factor, determines which child shall live and babies fed food other than mother's milk as a rule are greatly handicapped in the struggle for existence.

Although this book is primarily intended for nurses and mothers, pharmacists will find it an excellent addition to their library.

OTTO RAUBENHEIMER, Ph. M.